ES-NIROSAN®
TECHNICAL INFORMATION AND ASSEMBLY INSTRUCTIONS

1. System description and possible uses

1.1 Areas of use

Modern building equipment and appliances make great demands of the utilities supply systems. Safety, durability, hygiene and not least cost-efficiency are the criteria by which pipe systems are judged and deployed. The SANHA® NiroSan® press-fit system is a DVGW-tested crimping system that complies with all market requirements (DVGW DW 851 AU- 2127). The system components, i.e. pipes, fittings and accessories, are matched to each other and exceptionally well suited to use in drinking water installations for cold and hot water.

In addition the system is suitable for:

1. re-processed water, softened water, partially and fully desalinated water, including also: de-carbonised water, de-mineralised water, osmosis water, distilled water,
2. compressed air, free of oil, up to 16 bar (for technical compressed air - containing oil - on request),
3. steam condensate, both as dry and as wet condensate piping up to 130°C or 16 bar,
4. water containing soap (clilavitt) pH 12, very alkaline, water containing ethylene glycol (anti-freeze), water containing alcohol (windscreen washer fluid), solar power systems containing a water/glycol mix for long-term exposure to 120°C – for temperatures up to 200°C on request,
5. service and rain water utilisation systems,
6. heating systems,
7. district heating systems, directly run up to 200°C on request,
8. pipelines for conveying bulk materials,
9. pipelines for noble gases and technical gases,
10. pipelines for conveying corrosive water,
11. pressurised drainage of roofs and parts of buildings,
12. pipelines for industrial facilities.

If any special tasks relating to conveying liquids, corrosive fluids or technical gases or if, in general, upcoming challenges in the industrial field need to be solved, the suitability of SANHA® NiroSan® press-fit systems ought to be checked in each individual case. In such cases please contact our technical customer support team.

Safety, durability and hygiene are guaranteed by:

- SANHA® NiroSan® system fittings:
  Made of non-corroding steel, material no. 1.4404, 1.4571, 1.4408
- Moulded part seal:
  EPDM, peroxide cross-linked, suitable for drinking water as per the recommendations on contact with drinking water from the Federal Office of Public Health.
- SANHA® NiroSan® system-based pipes:
  material 1.4404
- Connection technique:
  crimping pipe and fitting together at three levels using appropriate crimping tools ahead of, towards and up to a measurement of 54mm, including behind the seal.

1.2. System description

The SANHA® NiroSan® press-fit system consists of the following system components.

1. SANHA® NiroSan® system pipe

Stainless steel pipes (DVGW – W 541) material 1.4404. The pipes are bright annealed, stress relieved and solution annealed. There is an upper limit on their rigidity in order to ensure adequate and permanent deformation of fitting and pipe when using appropriate standard crimping tools and dies recommended by SANHA®.

2. SANHA® NiroSan® crimp fittings and threaded parts,
material number 1.4404 (shaped parts) , 1.4571 (threaded parts) and 1.4408 (precision-cast stainless steel parts).

The crimp fittings are pickled for corrosion-related reasons, bright, solution and soft annealed and stress relieved. The crimp fitting's degree of hardness thus becomes ostensibly that of the SANHA® NiroSan® system pipe and secure, permanent deformation during the crimping process is ensured.

3. Seal

Sealing rings made of EPDM, peroxide cross-linked and tested in line with the recommendations on contact with drinking water from the Federal Office of Public Health are inserted into the fitting as standard at the factory (9000 range). This high-quality polymer is particularly well-suited to use in drinking water pipeline systems up to a maximum operating temperature of 120°C.
For higher temperatures (max. 200°C) and corrosive media SANHA® NiroSan® system fittings with seals made of special elastomer are available (18000 range). In terms of the area of use, please contact our technical customer support team.
If for particular areas of use seals and fittings are required to be absolutely free of silicon (paint shops, automotive industry), then SANHA® NiroSan® system fittings with special FPM seals (19000 range) are available for this.

4. Tool

When designing and developing the SANHA® NiroSan® press-fit system, the sleeve shape was defined in such a way that it is possible to use dies and presses already present on the market (cf.1.2.4.). For anyone working with these systems there is generally therefore no need to invest in new tools.
SANHA®, however, recommends the ECO 301 electronic SANHA® press with SANHA® dies and press collars (cf. also table 3). In combination with the SANHA®-specific eight-edge profile (12-35 mm) or nine-edge profile (42-54 mm) and especially with the SANHA® profile for dimensions 76.1 to 108mm this produces a very round crimp that does little harm to the material.

1.2.1 Working with stainless steel

Drinking water that comes into contact with other substances, such as e.g. pipeline materials, container materials etc., may react chemically with them. If, for example, the pipeline is made of copper, then as a result of this reaction copper ions in the drinking water dissolve. Lead, nickel etc. can get into drinking water from fittings and apparatus components. How much gets in depends on the length of time that is available for the reaction processes - i.e. on how long the water remains in the pipeline - and on the condition of the water.

Type and maximum permitted volumes (limits) in relation to toxic substances are stipulated in the Drinking Water Directive (TrinkwV). In order to ensure that these levels are not exceeded, attention must be paid when selecting materials to the utilisation criteria set out in DIN 50930-6. Pursuant to these there is no restriction on the area of use for non-corroding steels as defined by DVGW worksheets W 534 / W 541. The SANHA® NiroSan® press-fit system can thus be used without restriction in all drinking waters.
If the SANHA® NiroSan® press-fit system is to be used in the industrial sector for any of a wide array of media, in swimming pools or for conveying seawater, we ask that in respect of exposure to potential corrosion you please speak to our technical customer support team. When planning and assembling any systems, you should as a general principle avoid any high concentrations of chloride, which could affect the system from the outside.

The main advantages of the stainless steel grades used in the SANHA® NiroSan® press-fit system are:

a) Extreme resistance to corrosion
b) Mechanical strength
c) Permanently smooth surfaces
d) No migration of metal ions
e) Excellent hygienic qualities
f) Long service life
g) Hardness of stainless steel

a) Stainless steel's resistance to corrosion

Due to its integral alloy elements, when it comes into contact with water that contains oxygen, i.e. drinking water, stainless steel forms a passive coating on its surface consisting predominantly of chrome oxide. This coating prevents any further reaction between drinking water and the pipeline material. Regardless of the condition of the drinking water, it is thus impossible for the pipeline material to have any influence on it. Pitting is extremely rare in stainless steel and can only occur if the critical corrosion potential (e.g. through high chloride ion or bromide ion concentrations) is exceeded. If simultaneously put under strain by critical tensile stress, stress-crack corrosion can also occur. Higher temperatures (> 90 ... 100°C) increase any existing risk of corrosion. In order to avoid corrosion damage of this kind, DIN 50930, part 4 therefore recommends for chloride concentrations of over 200 mg/l the use of stainless steels containing molybdenum. Concentrations above this level can in certain circumstances be achieved in stagnating drinking water through local concentration-increasing processes, which is why it generally makes sense to use stainless steels containing molybdenum. The grades of stainless steel used in the SANHA® NiroSan® press-fit system contain molybdenum as an alloy component, thus achieving extreme resistance against pitting and stress-crack corrosion.

The material can be made more susceptible through oxide coatings, tempering colours, incorrect heat treatment (e.g. during welding) and polishing the components, resulting in an increased likelihood of pitting. The same effect is caused by oxidation agents, such as are used, for example, for disinfection, if they are added to drinking water and able to take effect over a relatively long time. Their use is therefore allowed only subject to specific provisos. The use of chlorine oxide as a disinfectant is not permitted under any circumstances.

In the case of the SANHA® NiroSan® press-fit system a permanently watertight pipe connection is achieved by cold forming of the material. This ensures that any risk of making the material more susceptible is avoided. This criterion must also be satisfied by correct assembly of the systems. For example, when separating the pipes it is essential to avoid any impermissible heating up of the interfaces - such as is unavoidable when using cut-off wheels (Flex). Direct contact with the unalloyed steel leads to no passive layer being able to form at the point of contact and thus the material becomes susceptible there. You must therefore not use any tools for separating or deburring the pipes that have previously been used on unalloyed steel. Attention must also be paid to these interactions when storing and transporting the pipes and fittings. Where stainless steels containing molybdenum are worked with correctly the corrosion mechanisms referred to above play no role. Under the operating conditions that arise in drinking water installations the potential for pitting is not reached. In the electrochemical series stainless steel has a somewhat higher potential than copper and much higher than zinc-plated steel. In drinking water installations where on the one hand there exists an electron-conducting link (i.e. generally a metallic-conducting combination) and on the other an ion-conducting link (i.e. generally a combination through an electrolyte such as, e.g., drinking water) between stainless steel and the electrochemical less noble material cathodic/anodic effects can therefore occur. In this process the less noble metal dissolves to the benefit of the more noble stainless steel. This corrosion mechanism is called contact corrosion. The manifestation of contact corrosion is shallow pitting.

The corrosion current created by this mechanism is dependent on the potential difference between the two metals and on the ion-conductivity of the electrolyte (i.e. on the condition of the water). However, the speed at which the less noble metal dissolves is not dependent solely on the level of corrosion current, but rather on the density of the corrosion current (level of corrosion current related to the corroding surface area). In the case of contact with zinc-plated steel it is generally adequate to create a distance between the stainless steel and the zinc-plated steel that is approximately the same as the pipe diameter in order to adequately avoid the ion conductivity of the drinking water. This can be done, for example, using a fitting between the two steels made of gunmetal or brass.

For mixed installations of stainless steel and copper the relationships can be rated much less critically, as the potential difference between copper and stainless steel is minimal. Copper only dissolves at a speed (corrosion current density) of any technical relevance where the copper area is very small in comparison to that of the stainless steel. This is the case, as shown by practical experience, when, for instance, a single copper fitting is built into an extensive stainless steel installation. We know of no scientific literature on any tests as to where the critical area-to-area ratio lies. To be on the safe side in terms of any possible damage caused by contact corrosion between copper and stainless steel **the ratio of copper material area** (copper, including gunmetal and brass) **to stainless area should not be appreciably less than 0.02.** The order of the different materials is immaterial. **The flow rule familiar from fitting copper and zinc-plated steel together in drinking water pipelines does not therefore need to be considered when combining copper or zinc-plated steel and stainless steel.** In heating systems these interrelationships do not apply. The heating water in properly installed and operated heating systems is largely free of oxygen. Without oxygen there is, however, no metal corrosion under the operating conditions of relevance here.

Conclusion: the laboratory tests run to date and in particular existing practical experience have shown that for the materials used no corrosion damage is to be expected from any drinking water or water of a similar composition.

b) Mechanical strength

Stainless steel is very strong. Its tensile strength is at least Rm 550 N/mm² and proportional limit Rp0.2 240 N/mm². These levels of strength provide certainty against the pipes and moulded parts bending or becoming physically damaged during assembly, modification or operation of the installations.

c) Surface qualities

Due to its mechanical strength the surface of stainless steel is very hard and highly durable. As a result of these qualities the material suffers, e.g. when highly exposed to particles carried in drinking water, practically no erosion. The smooth surfaces of the stainless steel pipes remain preserved even after longer than average use so that the minimal current loss from the outset and the usage characteristics of the installation remain consistent and unchanged. Stainless steel pipelines look permanently good and are totally maintenance-free. For the architects drawing up the plans stainless steel systems thus offer new creative possibilities.

d) Migration of pipeline materials

Migration of pipeline materials means the absorption of elements of the pipe material as dissolved substances (ions) in the transported medium. In the case of stainless steel components containing molybdenum no migration takes place, because the passive coating on the surface prevents the ions dissolving. Even in the event of longer intervals of stagnation the condition of drinking water is not influenced or changed by dissolving metal ions. The SANHA® NiroSan® press-fit system can therefore – as DIN 50930-6 stresses as well – be used in all drinking waters, regardless of their condition. In the case of other materials (e.g. lead pipelines) it is possible, especially when the water stagnates, for concentrations of heavy metal ions to occur that reach or even exceed the limits stipulated in the Drinking Water Directive.

e) Hygienic qualities of stainless steel

The long-practised use of stainless steel in food processing, food preparation and for medical equipment provides clear proof of this material's harmless qualities in terms of hygiene. In addition to its neutral effect on taste and excellent surface quality, there is another benefit that has become particularly valued in recent times: in terms of microbiological characteristics stainless steel behaves in an inert way. That means that stainless steel surfaces (unlike surfaces of organic materials) provide no support for any microbiological growth. Bacteria, putrefactive agents and spores, etc. thus have no chance to grow on stainless steel surfaces. This positive property of stainless steel directly benefits drinking water and generally makes any disinfection measures superfluous in stainless steel drinking water systems.

f) Long service life of stainless steel

The SANHA® NiroSan® press-fit system made of stainless steel, material no. 1.4404/1.4571/1.4408 has an excellent level of endurance. It is mechanically very strong and is very resistant to corrosion. Particles carried with the drinking water (e.g. grains of sand washed into it) cause practically no abrasion or erosion. Meanwhile the smooth surfaces of the stainless steel pipe walls make it difficult for any substances dissolved in the drinking water to deposit themselves and consequently hardly any incrustations are able to form. The carefully selected alloy components also guarantee that the systems remain stable and watertight for the long term. The special properties of the stainless steel ensure that even after relatively long use no metal ions dissolve and no abrasion or reduction in the thickness of the pipe walls occurs. Drinking water installations made from the SANHA® NiroSan® press-fit system are hygienic, stable, reliable, do not impair the condition of the water and can also be deployed without any harm as mixed installations.

g) Hardness of stainless steel

As the SANHA® NiroSan® press-fit system offers for those working with it the benefit of being able to use standard and possibly already existing presses and dies, although stainless steel is an extremely 'hard' material with relatively high elastic recovery, both the SANHA® NiroSan® system pipe and the SANHA® NiroSan® system fittings are bright, solution and soft annealed and stress relieved. Through exact adherence to the degree of hardness prescribed at the factory for the system components a reliable and permanently watertight joint is achieved even when using different presses and dies.

1.2.2 System components

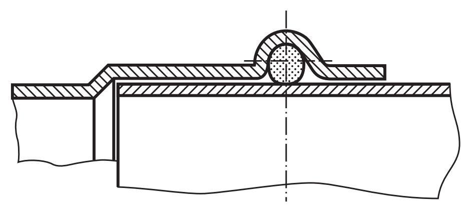
For formulating tender document texts table 1 provides an overview of the components of the SANHA® NiroSan® press-fit system. Finished tender document texts are available on diskette in the DATANORM 4.0 format and can be requested from our field advisers.

SANHA® NiroSan® press-fit system	
Pipe material	SANHA® NiroSan® system pipe Non-corroding steel, material no. 1.4404
Moulded part material	SANHA® NiroSan® press fittings Non-corroding steel, material no. 1.4404, 1.4408
Seal material	EPDM, peroxide cross-linked / special elastomer
Connection technique	SANHA® NiroSan® press-fit system
Area of use	See point 1.1
Operating temperature range	EPDM: -30 °C ... 120 °C (9000 range) or FPM: -20 °C ... 200 °C (18000 & 19000 ranges)
Operating pressure	See table 5
Licences (pipes and moulded parts)	DVGW system approval: DW – 8511AU2127 SVGW system approval: 9912 – 4179 ÖVGW system approval: W – 1.287
Advantages of the system:	• universally usable, wide range • fast, easy assembly • robust, reliable design • especially resistant to corrosion • seals made of KTW-approved elastomer • all components made of stainless steel

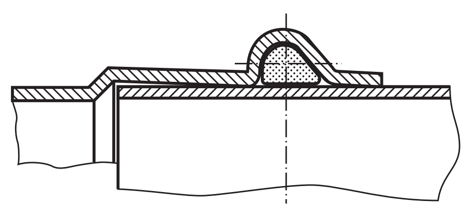
Table 1: Overview of SANHA® NiroSan® system components

1.2.3 Connection method

What makes the SANHA® NiroSan® press fittings special is the way in which the sleeve sockets are designed and made, thus making them reliable to work with and ensuring watertight, permanent joints. Pressing takes place up to and including 54mm in three levels - in front of the crimp, on the crimp and behind the crimp (see picture 2). This ensures high pull-out resistance. Any hydraulic shocks occurring in the installation thus represent practically no risk to the soundness of the system. Using a template (catalogue no. 4981), the insertion depth of the pipe end (cut to length at right angles and cleanly deburred) is marked, then, being rotated slightly, pushed into the sleeve socket (see also the relevant assembly information). The permanently watertight connection is produced by pressing together. The very fast pressing together creates a permanent, form-locked and force-locked joint.

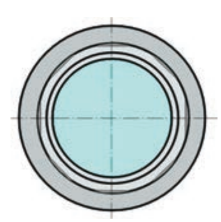


Picture 1: Pipe joint not pressed together, dimensions up to 42mm

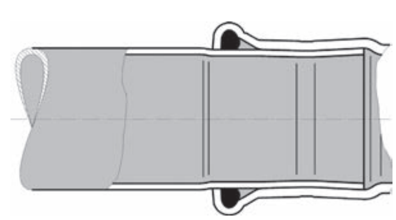


Picture 2: Pipe joint pressed together, dimensions up to 42mm

In combination with the SANHA® -specific eight-edge profile (12 mm to 35 mm) or nine-edge profile (42 mm and 54 mm) or the special profile for dimensions over 54 mm (76.1 mm to 108 mm) a very round crimp is produced that does little harm to the material.



Picture 3: 8-edge pressing with dimensions of up to 35 mm, almost round crimping pattern



Picture 4: Pressing of dimensions 76.1 mm to 108 mm at 2 levels

For dimensions above 54 mm diameter there are no standard presses available on the market that generate sufficient force to crimp stainless steel at 3 levels, it being 2.5 times harder than copper. Here therefore due to our expectations the presses available on the market should be approved and, from a technical point of view, crimping at 2 levels favoured.

1.2.4 Suitable and recommended crimping tools

Press fitting, pipe, die and press are always matched together in such a way that the interplay of these four components produces permanently watertight, adequately pressure-resistant joints. That, however, means on the other hand that the tolerances to be coped with by the system must spread themselves over the components. In the case of the press fitting and the pipes SANHA® provides for very narrow production tolerances. That makes it especially important that die and press function perfectly. Worn dies in particular and also presses that no longer work perfectly (because, for example, the press hub has shifted over time) can thus lead to insufficiently sound joints.

Both dies, which necessarily become worn in the course of operation, and presses must therefore be subjected to regular checks to ensure that they are working correctly. All dies and presses should as a basic principle be serviced at least once a year. In order to achieve a permanent, sound crimp, it is possible up to and including the dimension of 54 mm to use crimping tools that generate in the pressing process linear forming pressure of at least 30 kN. If any appreciably higher levels of linear forming pressure arise (over 33 kN), the dies could become damaged (beware, risk of injury!).

For crimping the SANHA® NiroSan® press fitting with the SANHA® NiroSan® system pipe the presses and dies listed in table 2 can be used if they are in perfect condition, the inspections and maintenance intervals stipulated by the manufacturer have been adhered to and they are used in accordance with the manufacturers' operating instructions. Every SANHA® press has a round servicing label. The marking on the label indicates when the machine next has to be sent in for maintenance to Novopress or to a specialist workshop authorised by Novopress. Where maintenance is carried out regularly (once a year) the warranty is extended to 3 years.

Picture 5: Servicing label

Presses from other system suppliers / machine manufacturers must be checked and serviced in accordance with their specifications and in any case at least once a year. The dies are subjected to strong, oscillating forces. In extreme cases this could lead to material fatigue or at least to clear wear - especially of the bolts. In order to reliably eliminate any dangerous accidents, there are two viable options here:

1. Regular servicing of the dies
   All worn and also any deformed parts get replaced in this process so that after the service a die is available to the operator that is as good as new.
2. Limiting service life
   The other possibility for preventing accidents is to apply to the die a predetermined breaking point in such a way that after a certain service life the die gets destroyed and can thus no longer be used.

On SANHA® dies and press collars both procedures are used. For the SANHA® dies and press collars for the electronic press (catalogue no. 6920, 6932, 6933 / adapter jaw catalogue no. 6931.1, 6931.2, 6931.3) and for the SANHA® Service Plus dies and press collars for conventional presses (catalogue no. 6940, 6932 / adapter jaw catalogue no. 6930) the regular servicing method is used. These dies are - as already described in the case of the SANHA® Novopress presses - provided with an inspection label, on which the date of the next inspection can be seen (see picture 5). Where regular servicing is carried out the warranty for these dies / press collars is extended to 5 years. The SANHA® Standard die (catalogue no. 6958) is by contrast designed so that when it reaches the end of its service life (after around 10,000 crimps) it cracks open at a predetermined breaking point. Such a die is thus irreparably destroyed and must be completely replaced. A difference needs to be made fundamentally between conventional and electronically controlled presses. With conventional presses it is a crimping process that always happens in the same way using the same amount of force. Differing from that, in the case of electronically controlled pressing the force used in the crimping process is optimised by means of a chip integrated within the die (which communicates with the electronics of the press), thus controlling the process in a way that does the least possible harm to the materials of tool, fitting and pipe. With smaller dimensions in particular this leads to a significant increase in the service life of die and press.

Conventional crimping

It is assumed that regular servicing / inspections have been carried out on all machines and dies / collars used.

Usable presses up to 54 mm diameter	
All presses are suitable that satisfy the following requirements: • Minimum pressing force: 30 kN • Forced completion control Once the crimping process has been started, it must be ensured that without further actions (e.g. pressing an emergency switch or similar) it is not possible for the machine to be taken off of what may be an incompletely crimped joint. Alternatively, the manufacturer can prove the tool's suitability through certification from an accredited test institute. • Crimping tool jaw's bolt diameter: 14 mm • Crimping tool jaw's minimum width: 33 mm	
For example: **SANHA®**	SANHA® (mains powered) ECO 201 (catalogue no. 6902, 6903), SANHA® (battery powered) ACO 201 (catalogue no. 6908, 6909),
Geberit	Geberit electromechanical pressing tool, type EFP2, Geberit ECO 201/ACO 201
Viega	Viega crimp system tool, type 2, Viega crimp system tool, type PT3-H, Viega rechargeable hand-held crimp, Viega rechargeable press REC SAN (up to 22 mm)
REMS	REMS Power Press drive units, REMS Rechargeable Press drive units
Geberit	Geberit press PWH 75
Roller	Roller's Uni-Press 2000 drive unit Roller's Multi-Press 2000 rechargeable press
Rothenberger	Romax Pressliner, Vario-Press 1000 APC
Usable dies and press collars up to 54 mm diameter	
Suitable products are dies and press collars for metal joint systems with SANHA®, Geberit or Viega profile	
For example: **SANHA®**	Service Plus dies and press collars 15 – 54 mm (catalogue no. 6940, 6930), Standard dies 15 – 35 mm (catalogue no. 6958)
Geberit	Geberit dies 15 – 54 mm Geberit press collars 42 – 54 mm
Viega	Viega dies for Profipress and Sanpress 15 – 54 mm
REMS	REMS crimps V 15 – 54 mm, M 15 – 54 mm, SA 15 – 35 mm
Roller	Roller's crimps V 15 – 54 mm, M 15 – 54 mm, SA 15 – 35 mm
Rothenberger	Vario-Press dies V 15 – 54 mm, M 15 – 54 mm
Other crimping tools for diameters 76.1 mm to 108 mm	
Geberit	HCP hydraulic cylinder in combination with hydraulic unit HA 5 and HCP press collars

Table 2: Suitable conventional crimping tools for SANHA® NiroSan® press fittings and SANHA® NiroSan® system pipe

Electronically monitored compression

It is assumed that regular servicing / inspections have been carried out on all machines and dies / collars used.

Usable crimping tools for all dimensions	
SANHA®	SANHA® (electronic), mains powered, type EFP3 for dimensions 12 mm to 54 mm, SANHA® (electronic), battery powered, type AFP3 for dimensions 12 mm to 54 mm, SANHA® (electronic), mains powered, type ECO 301 for dimensions 12 mm to 108 mm (catalogue no. 6900, 6901) SANHA® (electronic), battery powered, type EACO3 for dimensions 12 mm to 54 mm (catalogue no. 6904, 6905)
Geberit	Geberit electronic crimping tool, type EFP3/AFP3 (up to 54 mm) Geberit electronic crimping tool, type ECO 301
Usable dies and press collars for all dimensions	
SANHA®	SANHA® dies and press collars (electronic), catalogue no. 6920, 6931.1, 6932 (up to 54 mm), SANHA® press collars and adapter jaws (for SANHA® press ECO 301 only), catalogue no. 6933, 6931.2, 6931.3 (76.1 to 108 mm)
Geberit	Geberit dies and press collars (electronic) type EFP3/AFP3, Geberit press collars and adapter jaws (for pressing machine ECO 301 only)

Table 2: Suitable conventional crimping tools for SANHA® NiroSan® press fittings and SANHA® NiroSan® system pipe

1.3 Construction parts range

1.3.1 SANHA® NiroSan® system pipes

In accordance with the required flow rates / the nominal widths determined pursuant to DIN 1988-3, you are able to select from the following range of pipes:

Nominal width DN	Outer Ø mm	Wall thick-ness mm	Inner Ø cm²	Inner cross-section cm²	Pipe weight empty kg m⁻¹	Pipe weight filled with water kg m⁻¹
12	15.0	1.0	13.0	1.33	0.351	0.484
15	18.0	1.0	16.0	2.01	0.427	0.628
20	22.0	1.2	19.6	3.02	0.627	0.928
25	28.0	1.2	25.6	5.15	0.807	1.322
32	35.0	1.5	32.0	8.04	1.261	2.066
40	42.0	1.5	39.0	11.95	1.525	2.719
50	54.0	1.5	51.0	20.43	1.977	4.020
65	76.1	2.0	72.1	40.83	3.720	7.803
80	88.9	2.0	84.9	56.61	4.363	10.024
100	108.0	2.0	104.0	84.95	5.321	13.816

Table 4: Internal diameter, pipeline cross-section and pipe weight of the SANHA® NiroSan® system pipes

the SANHA® NiroSan® system pipes are made of stainless steel, material no. 1.4404, and supplied in 6-metre lengths. The pipes' lengthways seams are plasma arc welded, consequently ensuring that the pipe is absolutely watertight, very mechanically strong and protected from corrosion as required around the welded seam as well. The inner seam of the pipe is also smoothed so that no deposits are able to form at this susceptible spot. The pipes are bright, solution and soft annealed and stress relieved and have a defined maximum strength in order to create optimum pre-conditions for reliable, secure crimping.

1.3.2 SANHA® NiroSan® press fittings

The press fitting moulded parts are made of molybdenum-stabilised stainless steel piping, material no. 1.4404 or from precision-cast stainless steel, material no. 1.4408. The threaded parts are bonded to the base body by plasma arc welding and are made of stainless steel, material no. 1.4571. This material largely matches the quality of 1.4404, but in order to improve ease of machining additionally contains a maximum of 0.8 per cent by weight of titanium as an alloy component. This thus ensures for these parts too the high standard of quality of the SANHA® NiroSan® products.

2. Planning guidance

2.1 General planning guidance

Along with its components, the SANHA® NiroSan® press-fit system is approved for and can be used in drinking water systems, for cold and hot pipelines and for risers and distribution lines inside and outside buildings, but not, however, for direct laying in the earth. DIN 1988, parts 1 to 7 are applicable for the planning of drinking water installations. DIN 1988, part 8 is applicable for their operation. For the permissible operating conditions refer to table 5.

Pipe outer diameter	15 ... 22 mm	28 ... 35 mm	42 ... 54 mm	76.1 ... 108 mm
Nominal pressure (PN)	40	25	16	10
Max. operating temperature				
with EPDM seal (9000 range)	120 °C	120 °C	120 °C	120 °C
with FPM seal (18000 range)	200 °C	200 °C	200 °C	200 °C

Table 5: The SANHA® NiroSan® press-fit system's permitted operating conditions

2.1.1 Running the pipes

Drinking water installations must be planned, calculated and installed in accordance with DIN 1988, parts 1 to 7. Further requirements that must be adhered to are those of DVGW worksheets W 551 'Drinking water heating and pipeline system - Technical measures to reduce the growth of Legionella' and W 552 'Drinking water heating and pipeline system - Technical measures in relation to reducing the growth of Legionella, refurbishment and operation'. Regardless of the pipeline material, water that stands for a long time inside pipeline systems and devices can lose its drinking water quality. Although of all the materials usually used in the construction of drinking water installations stainless steel behaves in this regard far better than the rest, the pipe run should nevertheless be kept as short as possible and using pipes of unduly large diameter should always be avoided. Areas within the installation through which there is no flow are not allowed. DIN 1053 must be adhered to in the planning of masonry slots and installation shafts. As this standard often does not permit the required slot depths, wall-mounted installation is to be given preference in these situations (see ZVSHK 'Wall-mounted installation' leaflet).

2.1.2 Determining the pipe diameter

DIN 1988-3 is applicable for dimensioning. Accordingly the figures from table 19 of this standard are to be taken as the basis for the pressure loss due to pipe friction and those from table 27 as the basis for individual resistances. It is essential - as already explained at 2.1.1 - to avoid any over-dimensioning. Additionally applicable for drinking water circulation pipelines is DVGW worksheet W 553 'Design of circulation systems in central drinking water heating facilities'.

2.1.3 Thermal insulation

In order to keep heat loss as low as possible the following sets of rules need to be adhered to for hot pipes, pipes for heated drinking water and drinking water circulation pipes:

- DIN 4108, Thermal protection in buildings,
- Energy-Saving Directive (EnEV),
- Thermal Protection Directive (WschutzV).

The minimum levels of insulation thickness pursuant to these are contained in table 6.

Pipes for cold drinking water must be protected against impermissible heating up of the water and, where applicable, against the formation of condensate. They must be laid at a sufficient distance from sources of heat (e.g. hot pipes, chimney stacks or heating systems). If this is not possible, the pipes must be insulated such that the water quality is not impaired by heating up. Under usual operating conditions in the construction of flats thermal insulation needs to be provided. The thickness of the insulation can likewise be derived from table 6.

In selecting the insulating material attention should be paid to using material that is practically free of any chlorides. The per cent by weight of water-soluble chloride ions in the insulating material must not exceed 0.05%.

2.1.4 Noise protection

In order to ensure noise protection as defined by DIN 4109, it can be necessary in a few cases to wrap the pipe in elastic material. Here too the requirements in relation to the material being free of chlorides - as described above for thermal insulation material - must be observed. For pipe fixing suitable clamps with rubber inlays must be used (SANHA® catalogue no. 9918). For fixing distances see 2.2.13.

Pipeline for cold drinking water		Pipeline for heated drinking water	
Installation situation	Insulation thickness in mm $\lambda = 0.040\ W\ m^{-1}\ K^{-1}$	Outer Ø in mm	Outer Ø in mm $\lambda = 0.035\ W\ m^{-1}\ K^{-1}$
Pipeline laid exposed, in non-heated room (e.g. cellar)	4	15.0	20
Pipeline laid exposed, in heated room	4	15.0	20
Pipeline in duct, without any hot pipes	4	22.0	20
Pipeline in duct, next to hot pipes	13	28.0	30
Pipeline in masonry slot, riser	4	35.0	30
Pipeline in wall cavity, next to hot pipes	13	42.0	40
Pipeline on concrete ceiling	4	54.0	50
	-	76.1	65
	-	88.9	80
	-	108.0	100

Table 6: Minimum insulation thickness for pipelines

2.2 Laying instructions

2.2.1 Storage and transportation

During transportation and storage care must be taken to prevent the products becoming damaged or dirty or coming into contact with any iron or non-alloyed steel. When transporting by lorry, for example, it is therefore advisable to cover the cargo bed with a film if the lorry has previously carried pipes or components made of non-alloyed steel.

2.2.2 External corrosion protection

Stainless steel's high resistance to corrosion generally makes any external form of corrosion protection unnecessary. In special situations, such as in atmospheres containing chloride or chlorine (e.g. in swimming baths) even the stainless steel pipes of the SANHA® NiroSan® press-fit system do need protecting. Particularly suitable for doing this are chloride-free corrosion protection bands as per DIN 30672, which vulcanise in the overlap area into a homogeneous sheath coating. When adding these, attention must be paid to ensuring that there are no gaps in the sheathing. The corrosion protection bands must overlap by at least 15 mm.

2.2.3 Mixed installation

A mixed installation of the SANHA® NiroSan® press-fit system with other materials used in the drinking water installation does not have any detrimental effect on the corrosion characteristics of the SANHA® NiroSan® press-fit system. No particular sequencing of materials (as in the flow rule familiar in connection with copper and zinc-plated steel) needs to be taken in account.
In the event of contact with zinc-plated steel the latter becomes anodically polarised, which can lead to it being damaged by contact corrosion. Experience shows that a sufficient reduction in the likelihood of such damage can be achieved by creating a gap of around one pipe diameter between non-corroding steel and zinc-plated steel. This can be most easily achieved, for example, using a fitting between the two steels made of gunmetal or brass.

A mixed installation of the SANHA® NiroSan® press-fit system using components made of copper and/or copper alloys presents practically no problems at all. Only with very unfavourable surface ratios (percentage of the surface of all components made of copper materials in the whole installation appreciably less than 2%) is it possible in further unfavourable conditions for damage caused by contact corrosion to occur to a component made of copper materials.

2.2.4 Seals and sealing aids

Seals, such as flat gaskets, must not give off any chloride ions into the water or lead to any local concentrations of such ions. The seals used for SANHA® components, i.e. Centellen® seals (SANHA® catalogue no. DCU) fulfil this requirement. For threaded connections we recommend using a permanently elastic thread seal. When using hemp, a chloride-free sealing aid must be used. Using thread sealing tape (Teflon tape) is not recommended.

2.2.5 Bending

Hot bending stainless steel pipes is not allowed. The SANHA® NiroSan® system pipes of dimensions 15 mm to 28 mm can be cold bent using suitable bending tools. You must keep here to a bend radius (measured in the elbow's neutral axis) of at least r = 3.5 x da, where da is the outer diameter of the pipe.

2.2.6 Cutting

SANHA® NiroSan® system pipes should preferably be cut using a fine-toothed metal saw – ensuring that the saw blade has definitely not been previously used to cut any non-alloyed steel – or a pipe cutter (SANHA® catalogue no. 4985, specially for stainless steel). If an electrically powered saw is used, then in order to avoid making the material susceptible the cutting speed must not be so fast that any discolouring occurs around the cut. One suitable saw, for example, is the +GF+ RA 21 planetary saw.. Using cutting disks (Flex), not to mention cutting torches, is not allowed.

Caution!

After being cut to length, the pipe ends must be carefully deburred inside and outside (for pipes up to 54 mm outer diameter: SANHA® catalogue no. 4985).

2.2.7 Testing for leaks

Testing to ensure there are no leaks can be done either with water as per DIN 1988-2 or on a dry basis using an inert gas or oil-free compressed air as per the ZVSHK leaflet 'Testing for leaks with air' or BHKS rule 5.001 'Pressure testing of drinking water pipes using compressed air or nitrogen'. This must be done at a time when the joint locations are still accessible and have not been covered over. Dry testing for leaks is always advisable if it is going to be a relatively long time between the pressure test and actually starting to operate the installation. This is always the case whenever proceeding step by step on major building projects. If, as is customary on smaller building projects, the complete installation is being tested, the pressure trial can be done using water. In this case, the pipelines should be left sealed off and completely emptied or - as with the usual running of pipes these days that is hardly ever possible - completely filled with water up until they start to be used / until the flushing process to be carried out immediately prior to that. If there is a risk of frost during this period, then dry leak testing is to be favoured.

2.2.8 Flushing the drinking water installation

As a general principle, all drinking water pipelines, regardless of the type of material used, must be thoroughly flushed using filtrated drinking water. Flushing must be done as early as possible and after the pressure testing.
It should achieve the following objectives:

- Flushing of the drinking water quality (hygiene),
- Cleaning of the pipe inner surfaces,
- Avoidance of faults on fittings and devices

These requirements are met by two flushing methods. These are:

- Flushing with an air-and-water mix as per DIN 1988-2. Section 11.2,
- Flushing with water as per ZVSHK leaflet called 'Information on flushing drinking water installations designed in accordance with TRWI DIN 1988.'

For drinking water installations that have been created using the SANHA® NiroSan® press-fit system either flushing method can be used. Using either method the hygienic requirements that are made of drinking water installations will be fulfilled. Additional disinfection of the pipeline system is not called for in DIN 1988-2 and is also generally not necessary. If as an exception to the rule in an individual case disinfection of the pipelines is nevertheless necessary for any particular reason, details should be agreed in advance with our technical customer support team. Chlorine dioxide must not under any circumstances be used as the disinfectant.

Pressure testing, flushing and handover	
where building progress is fast Variant 1 (wet)	**Where there are long intervals between pressure testing and starting operation, Variant 2 (dry)**
1. Fit fine filter	1. Test pipeline for leaks using inert gas (e.g. oil-free compressed air, nitrogen) at 3 bar, including a section at a time, depending on building progress
2. Fill the pipelines for the first time with filtrated drinking water and fully bleed.	2. Fit fine filter
3. Perform pressure trial	3. Fill the pipelines for the first time with filtrated drinking water just before intended operational handover of the installation
4. Flush the installation using filtrated drinking water as per DIN 1988-2 or ZVSHK leaflet called 'Information on flushing drinking water installations designed in accordance with TRWI DIN 1988.'	
5. Bleed pipelines and leave filled and under pressure (avoid emptying / partial emptying)	
6. Operational handover of the system. Give client initial instruction and draw attention to DIN 1988-8 (avoiding any relatively long downtimes, necessary maintenance jobs)	

Table 7: Alternative procedure for pressure testing, flushing, handover and starting use

2.2.9 Electric trace heating

Electric trace heating can be used for the SANHA® NiroSan® press-fit system if the pipe inner wall temperature never exceeds 60°C. Briefly exceeding this level and going up to 70°C for the purposes of thermal disinfection (see DVGW worksheet W 552) is permissible.
When using electric trace heating, any sealed off pipeline sections that do not have their own safety mechanisms may not be heated. This is in order to avoid any impermissible increase in pressure in such sections. DIN 1988-4 / DIN EN 1717 must be observed without fail.

2.2.10 Electrical protective measures

In accordance with DIN VDE 0100, potential equalisation must be run for all electrically conductive pipelines. The SANHA® NiroSan® press-fit system is a pipe connection capable of conducting electric current from end to end and must thus be included in the potential equalisation. The person or company installing the electrical systems is responsible for carrying out these electrical protective measures.

2.2.11 Lengthways expansion and fixing of the pipelines

Depending on the temperature difference hot pipes expand to varying degrees (see picture 6). If the pipelines are hindered in this thermally induced lengthways change, then the mechanical tension levels prevailing within the pipeline material may exceed the permitted level, as a result of which damage (generally in the form of fatigue cracks) can occur. In order to avoid this, the pipeline must be given sufficient room to expand.

The thermal expansion coefficient of stainless steel material no. 1.4401 is of the same order as that of copper. Table 8 shows the expansion coefficients of several pipe materials. In table 9 you can see the change in length dependent on temperature difference and length of pipe.

Example:

For a pipeline for heated drinking water of 8 metres in length with an operating temperature of tW = 60°C and a cold water temperature of tK = 10°C you need to work out the change in length ¢ l as a result of thermal expansion. Temperature difference Δ t = tW – tK = 60°C – 10°C = 50 K From table 9 we can see in the column for 50 K and the row for 8 m the change in length of the SANHA® NiroSan® system pipe of Δl = 6.6 mm that needs to be taken into account.

The elasticity of the pipe network can often be used to compensate for these changes in length. To this end it is necessary in the area of pipeline bends to create sufficiently flexible pipeline sides through correct arrangements of the securing clamps (see picture 7 and table 10).

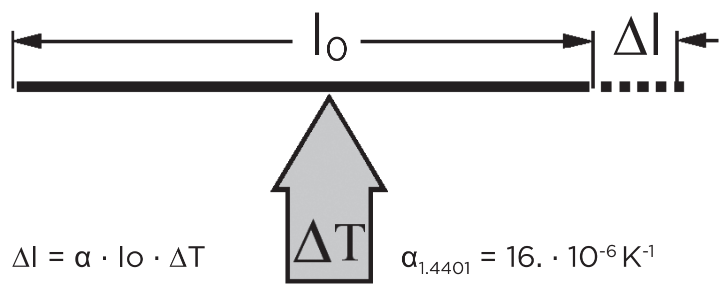
The basic principle is that between any two fixed points there must always be an adequate possibility of expansion.

If the natural run of the pipes does not facilitate sufficient compensation of the thermal expansion, this has to be achieved through the fitting of special components, such as, for example, metal bellow expansion joints. If there is sufficient space available, it is also possible to use a U-pipe expansion joint as per picture 8 / table 11.

Pipe material	Coefficient of thermal expansion α in 10^{-6} K^{-1} (20 to 100 °C)	Δ l in mm for L_o = 10 m Δ T = 50 K
Stainless steel	16.5	8.3
Copper	16.6	8.3
Steel pipe, zinc-plated	12.0	6.0
Plastic (depending on pipe material)	80 to 180	40 to 90

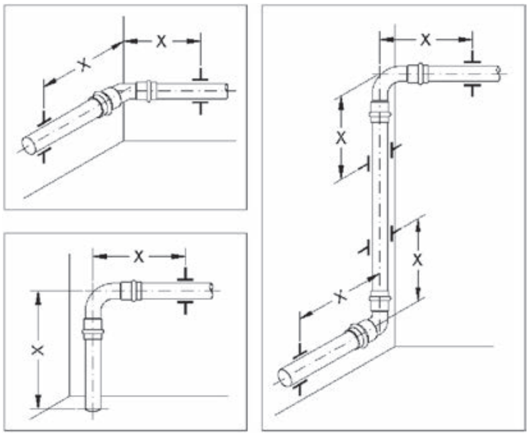
Table 8: Thermal expansion of different pipe materials

Thermal expansion of stainless steel material no. 1.4401 in mm							
Pipe length	Temperature difference in K						
m	20	30	40	50	60	70	80
1	0.33	0.50	0.66	0.83	0.99	1.16	1.32
2	0.66	0.99	1.32	1.65	1.98	2.31	2.64

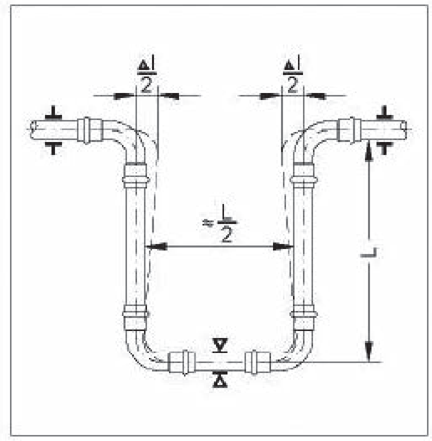


$\Delta l = \alpha \cdot l_o \cdot \Delta T$

$\alpha_{1.4401} = 16. \cdot 10^{-6}\,K^{-1}$



Picture 7:
Minimum distance X in relation to the absorption of thermal expansion



Picture 8:
U-pipe expansion joint

Required side length X in m

Pipe outer Ø in mm	Expansion absorption in mm 5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
15.0	0.40	0.57	0.69	0.80	0.90	0.98	1.06	1.13	1.20	1.27	1.33	1.39	1.45	1.50	1.55
18.0	0.44	0.62	0.76	0.88	0.98	1.08	1.16	1.24	1.32	1.39	1.46	1.52	1.58	1.64	1.70
22.0	0.49	0.69	0.84	0.97	1.09	1.19	1.28	1.37	1.46	1.54	1.61	1.68	1.75	1.82	1.88
28.0	0.55	0.77	0.95	1.10	1.22	1.34	1.45	1.55	1.64	1.73	1.82	1.90	1.97	2.05	2.12
35.0	0.61	0.87	1.06	1.22	1.37	1.50	1.62	1.73	1.84	1.94	2.03	2.12	2.21	2.29	2.37
42.0	0.67	0.95	1.16	1.34	1.50	1.64	1.77	1.90	2.01	2.12	2.22	2.32	2.42	2.51	2.60
54.0	0.76	1.08	1.32	1.52	1.70	1.86	2.01	2.15	2.28	2.41	2.52	2.63	2.74	2.85	2.95
76.1	0.90	1.28	1.56	1.81	2.02	2.21	2.39	2.55	2.71	2.86	2.99	3.13	3.26	3.38	3.50
88.9	0.98	1.38	1.69	1.95	2.18	2.39	2.58	2.76	2.93	3.09	3.24	3.38	3.52	3.65	3.78
108.0	1.08	1.52	1.86	2.15	2.41	2.63	2.85	3.04	3.23	3.40	3.57	3.73	3.88	4.02	4.17

Table 10: Minimum distance 'X' for absorbing the thermal expansion (see picture 7)

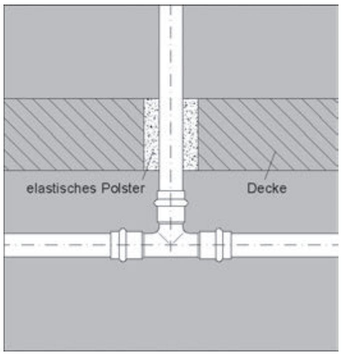
Length of the U-elbow L in mm

Pipe outer Ø in mm	Expansion absorption in mm 5	10	15	20	25	30	35	40	45	50	55	60	70	80	90
15.0	0.23	0.33	0.40	0.46	0.52	0.57	0.61	0.65	0.69	0.73	0.77	0.80	0.87	0.93	0.98
18.0	0.25	0.36	0.44	0.51	0.57	0.62	0.67	0.72	0.76	0.80	0.84	0.88	0.95	1.01	1.08
22.0	0.28	0.40	0.49	0.56	0.63	0.69	0.74	0.79	0.84	0.89	0.93	0.97	1.05	1.12	1.19
28.0	0.32	0.45	0.55	0.63	0.71	0.77	0.84	0.89	0.95	1.00	1.05	1.10	1.18	1.26	1.34
35.0	0.35	0.50	0.61	0.71	0.79	0.87	0.94	1.00	1.06	1.12	1.17	1.22	1.32	1.41	1.50
42.0	0.39	0.55	0.67	0.77	0.87	0.95	1.02	1.10	1.16	1.22	1.28	1.34	1.45	1.55	1.64
54.0	0.44	0.62	0.76	0.88	0.98	1.08	1.16	1.24	1.32	1.39	1.46	1.52	1.64	1.76	1.86
76.1	0.52	0.74	0.90	1.04	1.17	1.28	1.38	1.47	1.56	1.65	1.73	1.81	1.95	2.09	2.21
88.9	0.56	0.80	0.98	1.13	1.26	1.38	1.49	1.59	1.69	1.78	1.87	1.95	2.11	2.25	2.39
108.0	0.62	0.88	1.08	1.24	1.39	1.52	1.64	1.76	1.86	1.96	2.06	2.15	2.32	2.48	2.63

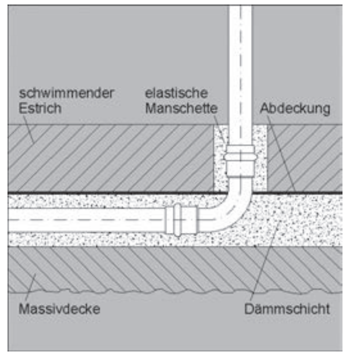
Table 11: Length 'L' of the U-elbow as an expansion joint for absorbing the thermal expansion (see picture 8)

Where pipes are laid concealed unimpaired thermal expansion must be ensured by the pipes being clad in elastic chloride-free material of sufficient thickness.

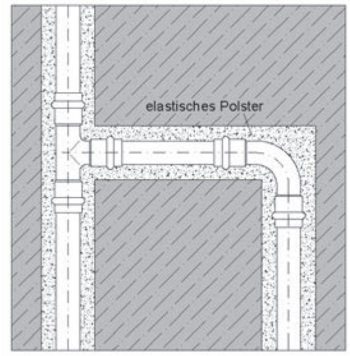
Pipe runs through ceilings, in particular, must - unless a fixed point has been consciously positioned there - be carefully padded out (see pictures 9-11).



Picture 9: Pipelines concealed below plaster



Picture 10: Pipelines in ceiling openings



Picture 11: Pipelines beneath the screed (within thermal and footfall sound insulation)

Pipeline fixings

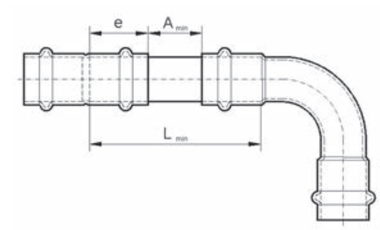
Using standard clamps, pipelines must be attached directly to the building and may not be secured to other pipes. In order to comply with noise insulation requirements, clamps with rubber inlays (SANHA® catalogue no. 9918) should be used. The distances between clamps are shown in table 12 (excerpt from DIN 1988-2). Clamps must always be attached to the pipe and not to the fitting. In order not to create any fixed points unintentionally, you need to keep to distance 'X' from any bends. As devices and appliance connections act like fixed points, distance 'X' also needs to be kept from them (see picture 7 and table 10).

Pipe outer Ø in mm	15.00	18.00	22.00	28.00	35.00	42.00	54.00	76.10	88.90	108.00
Securing distance in m	1.25	1.50	2.00	2.25	2.75	3.00	3.50	4.25	4.75	5.00

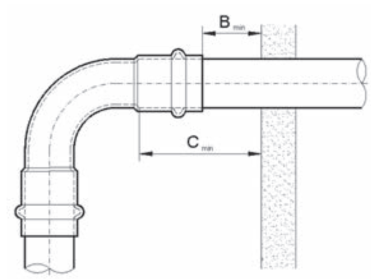
Table 12: Securing distances for pipelines made from the SANHA® NiroSan® press-fit system

2.2.12 Space requirements

The distance of the pipeline from walls, in corners and wall slots that is required for assembly is shown by the following sketches and tables.



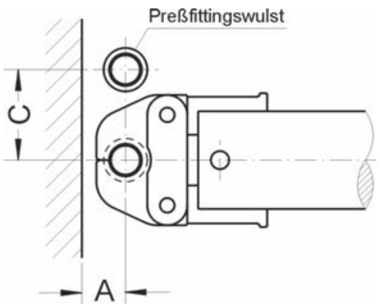
Picture 12: Minimum gap between two crimp points



Picture 13: Minimum gap between wall and crimp point

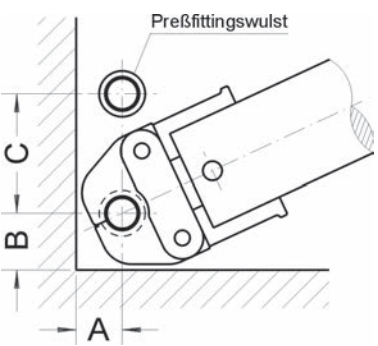
Pipe outer Ø	Nominal width	Insertion depth	Minimum distance			
			A_{min}	l_{min}	B_{min}	C_{min}
mm	DN	mm	mm	mm	mm	mm
15.0	12	25	10	60	60	85
18.0	15	25	10	60	60	85
22.0	20	28	10	66	60	88
28.0	25	29	10	68	60	89
35.0	32	30	10	70	60	90
42.0	40	38	20	96	60	98
54.0	50	44	20	108	60	104
76.1	65	50	30	130	60	110
88.9	80	57	30	144	60	117
108.0	100	69	30	168	60	129

Table 13: Minimum distance as per pictures 12 and 13



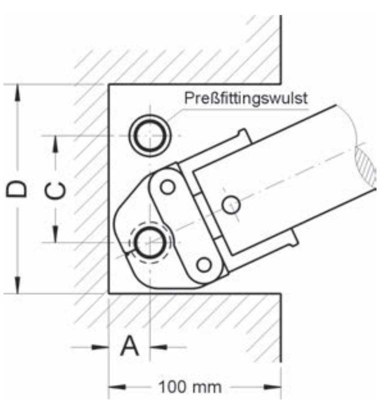
Picture 14: Minimum gap A of the pipelines to the wall and minimum gap C of the pipelines from each other

Pipe outer Ø mm	A mm	C mm
15.0	20	56
18.0	22	60
22.0	25	65
28.0	25	75
35.0	30	83
42,0 collar	65	90
42.0 die	45	140
54,0 collar	70	100
42.0 die	45	140
76.1	110	160
88.9	120	180
108.0	130	200



Picture 15: Minimum gap A of the pipelines to the wall, minimum gap B of the pipelines to the corner and minimum gap C of the pipelines from each other

Pipe outer Ø mm	A mm	B mm	C mm
15.0	28	40	75
18.0	28	43	75
22.0	31	50	80
28.0	31	54	80
35.0	31	61	84
42,0 collar	65	65	90
42.0 die	60	110	155
54,0 collar	70	70	100
42.0 die	60	110	155
76.1	110	200	220
88.9	120	200	220
108.0	130	200	230



Picture 16: Minimum width D of alcoves, minimum gap A of the pipelines to the alcove rear wall and minimum gap C of the pipelines from each other

Pipe outer Ø mm	A mm	C mm	D mm
15.0	20	56	56
18.0	22	60	60
22.0	25	65	65
28.0	25	75	75
35.0	30	83	83
42,0 collar	65	90	90
42.0 die	45	140	140
54.0 collar	70	100	100
42.0 die	45	140	140
76.1	110	160	160
88.9	120	180	180
108.0	130	200	200

Herstellung einer Pressverbindung

A) Abmessungen bis 54 mm

Bild 17

1. Rohre mit feinzahniger Metallsäge rechtwinklig ablängen. Das Sägeblatt darf nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 17a

Alternativ: Rohre mit Rohrabschneider trennen. Rohrabschneider und Schneidrad dürfen nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 18

2. Rohrende innen und außen sorgfältig entgraten. Das Entgratwerkzeug darf nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 19

3. Einstecktiefe mit Schablone (SANHA® Katalog-Nr. 4981) auf dem Rohr markieren. SANHA®-NiroSan® -Systemfitting auf korrekten Sitz des Dichtringes überprüfen und Rohrende unter leichtem Drehen in die Fittingsmuffe bis zum Anschlag einschieben. Der Fittingsaußenrand muss mit der Markierung übereinstimmen.

Bild 20

4. Pressbacke entsprechend der Fittingsabmessung auswählen und in Pressmaschine einsetzen. Haltebolzen der Maschine schließen.

Bild 21

5. Kontrollieren, ob Fittingsaußenrand mit Markierung übereinstimmt. Pressbacke öffnen und rechtwinklig so auf den SANHA® - NiroSan® -Systemfitting aufsetzen, dass die Sicke des Fittings in die Nut der Pressbacke eingreift.

Bild 22

6. Pressvorgang durch drücken der Start-Taste auslösen. Der Pressvorgang lässt sich nicht vorzeitig unterbrechen. Damit wird sichergestellt, dass stets eine dauerhaft dichte Verbindung entsteht. Im Gefahrenfalle ist eine Unterbrechung des Pressvorganges durch Drücken des Not-Aus-Tasters1) möglich.

   1) Nach Reset der Not-Aus-Situation muss eine Nachverpressung oder ggf. eine Neuverpressung erfolgen.

Bei den **Abmessungen 42 mm und 54 mm werden** – wegen der leichteren Handhabung – **bevorzugt Pressschlingen eingesetzt**. Die Montage erfolgt zunächst wie oben für die Schritte 1. bis 3. (Bilder 17 bis 19) beschrieben. Dann ist bei den Abmessungen 42 mm und 54 mm mit den Arbeitsschritten 7. Bis 10. (Bilder 23 bis 26) fortzufahren.

Bild 23

7. Passende Pressschlinge auswählen und so um den SANHA® -NiroSan® -Systemfitting legen, dass die Sicke des Fittings in die Nut der Pressschlinge eingreift. Pressschlinge schließen. Hierbei Schließlasche in Steckbolzen schieben. Beachten, dass die Pressschlinge eng am Fitting anliegt. Pressschlinge anschließend so in Position drehen, dass die Pressmaschine ordnungsgemäß angesetzt werden kann.

Bild 24

8. Zwischenbacke passend zur Abmessung auswählen:
Für die Abmessungen 42 mm und 54 mm Zwischenbacke ZB302 (SANHA® Katalog-Nr. 6931.1)– bzw. für kompatible Pressmaschinen Zwischenbacke ZB202 (SANHA® Katalog-Nr. 6930) – in die Pressmaschine einsetzen und Haltebolzen schließen.

Bild 25

9. Zwischenbacke durch Herunterdrücken der Backenhebel öffnen und so an die Pressschlinge ansetzen, dass die Krallen der Zwischenbacke um die Bolzen der Pressschlinge greifen. Kontrollieren, ob Fittingsaußenrand mit Markierung der Einstecktiefe übereinstimmt – Pressvorgang durch Drücken des Starttasters auslösen Der Pressvorgang lässt sich nicht vorzeitig unterbrechen. Damit wird sichergestellt, dass stets eine dauerhaft dichte Verbindung entsteht.
Im Gefahrenfalle ist eine Unterbrechung des Pressvorganges durch Drücken des Not-Aus-Tasters1) möglich.

1) Nach Reset der Not-Aus-Situation muss eine Nachverpressung oder ggf eine Neuverpressung erfolgen.

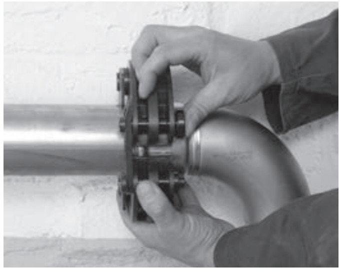


Bild 26

10. Lösen der Pressschlinge durch Abziehen der Schließlasche. Hierbei Steckbolzen von der gegenüber liegenden Seite herausdrücken.

B) Abmessungen 76,1 mm bis 108 mm
Für die **Abmessungen 76,1 mm, 88,9 mm und 108 mm** ist die Pressmaschine ECO 301 (SANHA® Katalog-Nr. 6900 bzw. als Set im Koffer mit 6 Pressbacken 15 mm bis 35 mm SANHA® Katalog-Nr. 6901) erforderlich. Zusätzlich werden Pressschlingen der entsprechenden Abmessungen (SANHA® Katalog-Nr. 6933) sowie für die Abmessungen 76,1 und 88,9 die Zwischenbacke ZB321 (SANHA® Katalog-Nr. 6931.2) benötigt.
Für die Abmessung 108 mm wird neben der entsprechenden Pressschlinge (SANHA® Katalog-Nr. 6933) zusätzlich zur Zwischenbacke ZB321 (SANHA® Katalog-Nr. 6931.2) die Zwischenbacke ZB322 (SANHA® Katalog-Nr. 6931.3) benötigt.

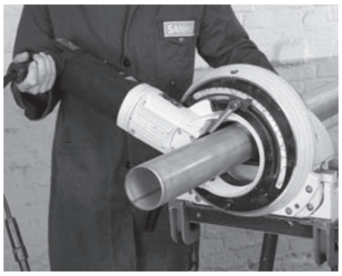


Bild 27

1. Rohre auf Maß ablängen: Vorzugsweise mit einer Planetensäge (Bild) oder Kappsäge. Die Schnittgeschwindigkeit muss so niedrig sein, dass keine unzulässige Erwärmung der Schnittkanten des Edelstahlrohres stattfinden kann. Das Sägeblatt darf nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 28

Alternativ: Rohre mit Rohrabschneider trennen. Der Rohrabschneider und das Schneidrad dürfen nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 29

Alternativ: Rohre mit feinzahniger Metallbügelsäge rechtwinklig ablängen. Das Sägeblatt darf nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 30

2. Schnittkanten außen sorgfältig entgraten. Vorzugsweise mit speziellem Entgratgerät (Bild: novopress-Rohrentgrater RE1). Alternativ: Halbrundschlichtfeile.
Die Entgratwerkzeuge dürfen nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 31

3. Schnittkanten innen entgraten.
Vorzugsweise mit speziellem Entgratgerät (Bild: novopress-Rohrentgrater RE1).
Alternativ: Halbrundschlichtfeile.
Die Entgratwerkzeuge dürfen nicht für unlegierte Eisenwerkstoffe verwendet worden sein.

Bild 32

4. Einstecktiefe mittels Schablone (SANHA® Katalog- Nr. 4990) auf dem Rohr anzeichnen. Abmessungen 76,1 mm und 88,9 mm.

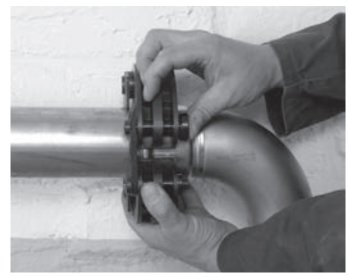


Bild 33

5. Rohrende unter leichtem Drehen in Fittingsmuffe bis zum Anschlag einführen. Markierung muss mit Fittingsaußenrand übereinstimmen. Passende Pressschlinge auswählen und so um den SANHA® -NiroSan® -Systemfitting legen, dass die Sicke des Fittings in die Nut der Pressschlinge eingreift. Pressschlinge schließen. Hierbei Schließlasche in Steckbolzen schieben. Beachten, dass die Pressschlinge eng am Fitting anliegt. Pressschlinge anschließend so in Position drehen, dass die Pressmaschine ordnungsgemäß angesetzt werden kann.

Bild 34

6. Zwischenbacke mit der Bezeichnung ZB321 (SANHA® Katalog-Nr. 6931.2) in Pressmaschine einsetzen und Haltebolzen schließen.

Bild 35

7. Zwischenbacke durch Herunterdrücken der Backenhebel öffnen und so an die Pressschlinge ansetzen, dass die Krallen der Zwischenbacke um die Bolzen der Pressschlinge greifen. Kontrollieren, ob Fittingsaußenrand mit Markierung der Einstecktiefe übereinstimmt – Pressvorgang durch Drücken des Starttasters auslösen Der Pressvorgang lässt sich nicht vorzeitig unterbrechen. Damit wird sichergestellt, dass stets eine dauerhaft dichte Verbindung entsteht.
   Im Gefahrenfall ist eine Unterbrechung des Pressvorganges durch Drücken des Not-Aus-Tasters[1)] möglich.

   [1)] Nach Reset der Not-Aus-Situation muss eine Nachverpressung oder ggf. eine Neuverpressung erfolgen.

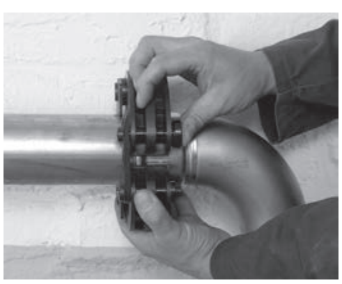


Bild 36

8. Lösen der Pressschlinge durch Abziehen der Schließlasche. Hierbei Steckbolzen von der gegenüber liegenden Seite herausdrücken.

Bild 37

9. Pressschlinge der Abmessung 108 mm wie in Schritt 5. (Bild 33) beschrieben ansetzen und zunächst mit Zwischenbacke ZB321 (SANHA® Katalog-Nr. 6931.2) wie in Schritt 7. (Bild 35) beschrieben verpressen. Zwischenbacke ZB321 durch Herunterdrücken eines Backenhebels von Pressschlinge abnehmen. Pressschlinge verbleibt an der Pressstelle (Pressschlinge lässt sich nicht lösen).

Bild 38

10. Zwischenbacke ZB322 (siehe SANHA® Katalog-Nr. 6931.3) in Pressmaschine ECO 301 einsetzen und zweiten Pressvorgang durchführen. Der Pressvorgang lässt sich nicht vorzeitig unterbrechen. Damit wird sichergestellt, dass stets eine dauerhaft dichte Verbindung entsteht. Im Gefahrenfalle ist eine Unterbrechung des Pressvorganges durch Drücken des Not-Aus-Tasters möglich.

    [1)] Nach Reset der Not-Aus-Situation muss eine Nachverpressung oder ggf eine Neuverpressung erfolgen.

Bild 39

11. Pressschlinge durch Herunterdrücken des Schließhebels öffnen und von der Verbindungsstelle abnehmen.

Producing a crimped connection

A) Dimensions up to 54 mm


Picture 17

1. Cut pipes to length at right angles using a fine-toothed metal saw. The saw blade must not have been used for any non-alloyed ferrous materials.


Picture 17a

Alternatively: cut pipes with a pipe cutter. Pipe cutter and cutting wheel must not have been used for any non-alloyed ferrous materials.


Picture 18

2. Carefully deburr pipe ends inside and outside. The deburring tool must not have been used for any non-alloyed ferrous materials.


Picture 19

3. Using a template (SANHA® catalogue no. 4981), mark insertion depth on the pipe. Check SANHA® NiroSan® system fitting to ensure sealing ring is correctly in place and, rotating it gently, push pipe end into the fitting sleeve as far at it will go. The outer edge of the fitting must match up with the marking.


Picture 20

4. Select die appropriate to the fitting size and insert into press. Close machine's retaining bolts.


Picture 21

5. Check that outer edge of the fitting matches up with the marking. Open die and place it at right angles onto the SANHA® NiroSan® system fitting in such a way that the fitting's crimp grips into the die's groove.


Picture 22

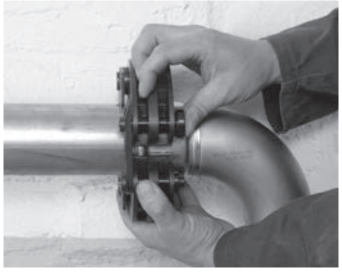
6. Start crimping process by pushing the start button. The crimping process cannot be interrupted prematurely. This ensures that a permanently watertight joint is always created. In the event of danger it is possible to interrupt the crimping process by pressing the emergency off button 1).

1) After the emergency stop situation has been reset, the joint will need further pressing / need to be repressed.

For **dimensions 42 mm and 54 mm it is preferable** – due to easier handling – **to use press collars**. Assembly is initially as described above for steps 1 to 3 (pictures 17 to 19). Then for dimensions 42 mm and 54 mm you continue with steps 7 to 10 (pictures 23 to 26).


Picture 23

7. Select suitable press collar and place it around the SANHA® NiroSan® system fitting in such a way that the fitting's crimp grips into the collar's groove. Close press collar. In doing so, push latch into locking pin. Make sure that the press collar is lying tightly against the fitting. Then turn press collar into position such that the press can be properly arranged.


Picture 26

10. Loosen the press collar by pulling off the latch. In the process push locking pin out from the opposite side.


Picture 24

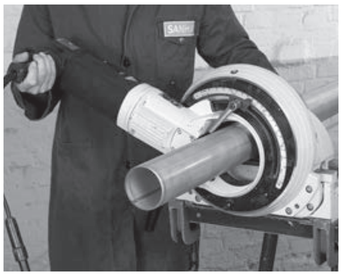
8. Select adapter jaw appropriate to the size: for dimensions 42 mm and 54 mm adapter jaw ZB302 (SANHA® catalogue no. 6931.1)– or for compatible presses adapter jaw ZB202 (SANHA® catalogue no. 6930) – insert into the press and close retaining bolts.

B) Dimensions: 76.1 mm to 108 mm
For **dimensions 76.1 mm, 88.9 mm and 108 mm** the ECO 301 press (SANHA® catalogue no. 6900 or as a set in a case with 6 x 15 mm to 35 mm dies, SANHA® catalogue no. 6901) is required. In addition, press collars of the corresponding sizes (SANHA® catalogue no. 6933) and for dimensions 76,1 and 88.9 the ZB321 adapter jaw (SANHA® catalogue no. 6931.2) are needed.
For size 108 mm as well as the corresponding press collar (SANHA® catalogue no. 6933) and the ZB321 adapter jaw (SANHA® catalogue no. 6931.2) you also need the ZB322 adapter jaw (SANHA® catalogue no. 6931.3).


Picture 25

9. By pressing down the jaw lever, open adapter jaw and arrange on the press collar in such a way that the adapter jaw's claws grip around the collar's bolts. Check that the outer edge of the fitting matches up with the marking of the insertion depth – Start crimping process by pressing the start button. The crimping process cannot be interrupted prematurely. This ensures that a permanently watertight joint is always created. In the event of danger it is possible to interrupt the crimping process by pressing the emergency off button 1).

1) After the emergency stop situation has been reset, the joint will need further pressing / need to be repressed.


Picture 27

1. Cut pipes to length: preferably using a planetary saw (pictured) or chop saw. The cutting speed must be sufficiently slow that no impermissible warming up of the cut edges of the stainless steel pipe can occur. The saw blade must not have been used for any non-alloyed ferrous materials.


Picture 28

Alternatively: cut pipes with a pipe cutter. The pipe cutter and the cutting wheel must not have been used for any non-alloyed ferrous materials.

Picture 29

Alternatively: cut pipes to length at right angles using a fine-toothed metal hacksaw. The saw blade must not have been used for any non-alloyed ferrous materials.


Picture 30

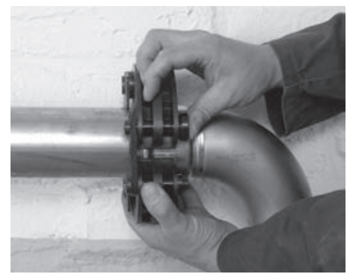
2. Carefully deburr cut edges. Preferably using a special deburring device (picture: Novopress RE1 pipe deburrer).
Alternatively: half-round fine file.
The deburring tools must not have been used for any non-alloyed ferrous materials.


Picture 31

3. Deburr cut edges on the inside.
Preferably using a special deburring device (picture: Novopress RE1 pipe deburrer).
Alternatively: half-round fine file.
The deburring tools must not have been used for any non-alloyed ferrous materials.


Picture 32

4. Using a template (SANHA® catalogue no. 4990), mark insertion depth on the pipe. Dimensions 76.1 mm and 88.9 mm.


Picture 33

5. Gently rotating it, guide pipe end into the fitting sleeve as far as it will go. Marking must match up with outer edge of fitting. Select suitable press collar and place it around the SANHA® NiroSan® system fitting in such a way that the fitting's crimp grips into the collar's groove. Close press collar. In doing so, push latch into locking pin. Make sure that the press collar is lying tightly against the fitting. Then turn press collar into position such that the press can be properly arranged.

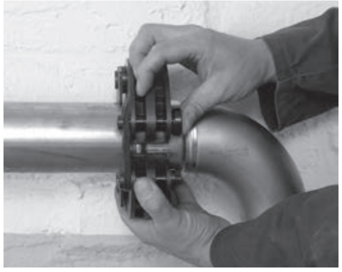

Picture 34

6. Fit adapter jaw ZB321 (SANHA® catalogue no. 6931.2) into press and close retaining bolts.


Picture 35

7. By pressing down the jaw lever, open adapter jaw and arrange on the press collar in such a way that the adapter jaw's claws grip around the collar's bolts. Check that the outer edge of the fitting matches up with the marking of the insertion depth – Start crimping process by pressing the start button. The crimping process cannot be interrupted prematurely. This ensures that a permanently watertight joint is always created. In the event of danger it is possible to interrupt the crimping process by pressing the emergency off button 1).

   1) After the emergency stop situation has been reset, the joint will need further pressing / need to be repressed.


Picture 36

8. Loosen the press collar by pulling off the latch. In the process push locking pin out from the opposite side.


Picture 37

9. Arrange press collar size 108 mm as described in step 5. (picture 33) and initially crimp using adapter jaw ZB321 (SANHA® catalogue no. 6931.2) as described in step 7 (picture 35). By pushing down a jaw lever, take adapter jaw ZB321 off press collar. Press collar remains on the crimping spot (press collar cannot be moved).


Picture 38

10. Insert adapter jaw ZB322 (see SANHA® catalogue no. 6931.3) into press ECO 301 and perform second crimping process. The crimping process cannot be interrupted prematurely. This ensures that a permanently watertight joint is always created. In the event of danger it is possible to interrupt the crimping process by pressing the emergency off button.

   1) After the emergency stop situation has been reset, the joint will need further pressing / need to be repressed.


Picture 39

11. By pushing down the jaw lever, open press jaw and remove from the joint position.

Verbindungstechnik Pressfittingsystem

Für die Installation Ihrer Es-Pressfit Trinkwasserinstallation mit dem Pressfittingsystem stehen Ihnen die bekannten Bauelemente, z. B. Doppelmuffen, Muffenbögen und T-Stücke, Reduzierungen, Übergänge zur Verfügung. Die ES-Pressfit Pressfitting-Formteile sind aus Edelstahl 1.4401 gefertigt. Die angeschweißten Drehteile werden aus technologischen Gründen aus der Edelstahlsorte 1.4571 hergestellt.

Die Besonderheit der Pressfittings Formteile sind die Konstruktion und Herstellung der Muffen, die eine zuverlässige Verarbeitung und dichte, dauerhafte Verbindungen sicherstellen. Durch die spezielle Ausformung der Muffe mit einer asymmetrischen Sicke wird das Einschieben des Rohres in die Muffe erleichtert und ein unbeabsichtigtes Auseinandergleiten der Bauteile erschwert, bzw. verhindert. Die Festigkeit der Verbindungen wird durch die Verwendung von Edelstahl für die Herstellung der Formteile erhöht. Die doppelte Verpressung der Muffe sichert eine hohe Auszugsfestigkeit und die erforderliche Entlastung der Dichtung von mechanischen Kräften. Im Ergebnis dieser und weiterer Lösungen steht dem Anwender eine gut verarbeitbare, sichere, zuverlässige und dauerhaft dichte Pressverbindung zur Verfügung.

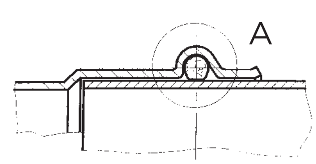
Verpressen der Anlage

Das Herstellen der dauerhaft dichten Verbindung erfolgt durch verpressen mit einer handelsüblichen Rohrpressmaschine. Es wird empfohlen, Original-ES-Pressfit-Presswerkzeuge zu verwenden, weil hiermit optimale Pressergebnisse erzielt werden.

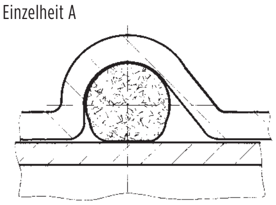
Die Verwendung anderer Presswerkzeuge (vergl. Tabelle) führt zu guten Ergebnissen, wenn die Pressbacken für die im ES-Pressfit System verwendeten Materialstärken (DN 15 bis DN 54: s = 1,5 mm), ausgelegt sind. Die Verwendung von Presswerkzeugen, die für andere Materialdicken ausgelegt sind, ist nicht zulässig!

Der empfohlenen Ablauf des Verpressens ist:

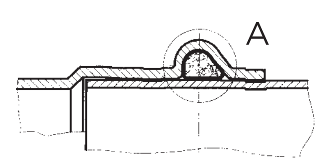
- Kontrolle der richtigen Einstecktiefe, um sicherzustellen, dass das Rohr bei der Vormontage nicht versehentlich aus den Formstücken herausgezogen wurde und eine sichere Verpressung möglich ist.
- Zange so ansetzen, dass die Sicke der Muffe in der mittigen Aussparung des Werkzeuges ist und nach der Bedienungsanleitung des Herstellers die Verpressung ausführen.
- Verpressungen systematisch in einer selbstgewählten Reihenfolge (z. B. in Fließrichtung des Wassers) durchführen, um sicherzustellen, dass alle Muffen aller Formteile verpresst wurden. (Hinweis: Beim Abdrücken der Leitung können u.U. auch unverpressteVerbindungen bei einem Prüfdruck von 16 bar noch dich sein, jedoch später im bestimmungsgemäßen Betrieb bei Druckstößen im System undicht werden oder vom Rohr gedrückt werden!)
- Prüfen der vollständigen und ordnungsgemäßen Verpressung.



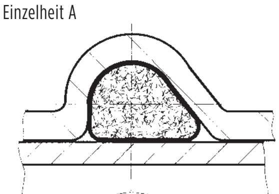
Einzelheit A



Rohrverbindung, unverpresst



Einzelheit A



Rohrverbindung, verpresst

Press fittings system

The usualcomponents, e.g. double sockets, elbow sockets, tees, reducing elements and adapters, can be used to install the ES-Pressfit drinking water installation with the press fittings system. ES-Pressfit fittings are made from stainless steel 1.4401. For technological reasons, the welded-on turned parts are made from grade 1.4571 stainless steel.

The special feature of the press fittings lies in the design and productionof the sockets which ensure reliable processing and adurable, tight connection. The special shape of the sockets with am asymmetric bead makes it easier to insert the pipe into the socket and makes it more difficult or impossible for the components todrift apart inadvertently. The strength of the connection is increased by the use of stainless steel for producing the fittings. Double compression of the socket ensures high tear-out-strenght and relieves the mechanical forces invariably acting on the garket. This and other features gives the user a press union which is easy to process, safe, reliable and enduringly thight.

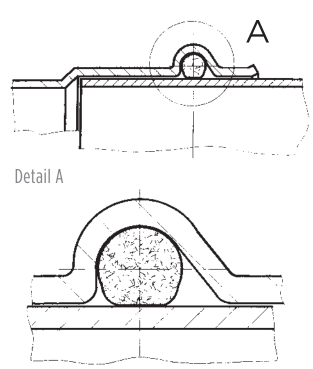
Compression

The enduringly thight connection is produced by compression using a standard commercial pipe press. It is advisable to use genuine ES-Pressfit pressing tools as they ensure that optimum results will be obtained.

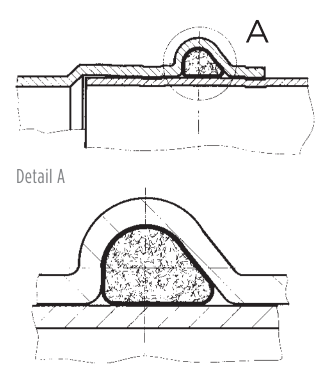
The use of other processing tools (cf. table) will also yield good resultsif the jaws are designed for material strengths used in the ES-Pressfit system (DN 15 to DN 54: s = 1,5 mm). Pressing tools designed for other material thicknesses must not be used.

The recommended procedure is as follows:

- Check the correct insertion depth in order to ensure that the pipe has not inadvertently been pulled out of the fittings during preliminary assembly and also to ensure that the parts can be properly pressed.
- Apply the pliers so that the bead of the socket is centered in the tool and then press as directed by the manufacturer.
- Systematically continue pressing in the order established individually (e.g. in the direction of flow of the water) in order to ensure that all sockets have been pressed in all fittings. (Note: When pressure-testing the pipes, unpresser connections may still be thight at a test pressure surges in the system during normal operation.)
- Check that all parts have been pressed completely and correctly.



Unpressed pipe union



Pressed pipe union

Pressfittingsystem

Pressfittingsystem	
Rohrmaterial	Edelstahl 1.4401
Formteilmaterial	Edelstahl 1.4401 bzw. 1.4571
Dichtungsmaterial	Elastomere: EPDM (spezialvernetzt)
Verbindungstechnik	Pressfittings
Einsatzgebiet	Trinkwasserinstallationen, Leitungen für Gase, Flüssigkeiten und Lebensmittel
Betriebstemperatur für Wasser	0 bis + 85° C
Betriebstemperaturbereich	- 30 bis + 130 °C
Prüfdruck	16 bar
DVGW-Zulassungs Rohre	DW-7301AT2037 vom 16.02.1998
DVGW-ZulassungsFormteile	Zulassung beantragt
Vorteile des Systems	• Universell einsetzbar • schnelle und einfache Montage • Robuste, zuverlässige Ausführung • Korrosionssicher • Dichtungen aus KTW-zugelassenem Kunststoff • Alle Bauteile aus Edelstahl

Press fittings system

Press fitting system	
Pipe material	Stainless steel 1.4401
Fitting material	Stainless steel 1.4401 and 1.4571
Seal material	Elastomers, EPDM (with special cross-linking
Connection technique	Press fitting
Uses	Drinking water installations, pipes for gases, liquids and foodstuffs
Service temperature for water	0 to +85 °C
Service temperature range	- 30 to + 130 °C
Test pressure	16 bar
DVGW permit, pipes	DW-7301AT2037 dated 16.2.1998
DVGW permit, fittings	Permit pending
Advantages of the system	• Can be universally used • Quick and easy installation • Robust, reliable workmanship • Corrosion-proof • Gaskets made from KTW-approved plastics • All parts made of stainless steel

Zum Einsatz empfohlene und geeignete Presswerkzeuge für ES-Pressfit-Präzisionsrohre und Pressfitings

Pressing tools suitable and recommended for use with ES-Pressfit precision pipes and press fittings

Hersteller/Vertreiber Manufacturer/Distributor	Einsetzbare Presswerkzeug Usable crimping tools	Einsetzbare Pressbacken Usable dies	
NiroSan	Klauke Elekrtropressmaschine/Electric crimping tool 230 Volt UP 2 El	NiroSan Pressbacken/Dies 15 - 42 mm	
NiroSan	Klauke Elekrtropressmaschine/Electric crimping tool UAP 2	NiroSan Pressbacken/Dies 15- 42 mm NiroSan Pressbacken/Dies „Hexa Dia"	in Vorbereitung/in preparation
SANHA	Pressmax (elektronisch) Typ EFP/ (electronically controlled) type EFP	SANHA Pressmax (elektronisch)/(electronically controlled) 15 -35 mm	
SANHA	Pressmax (elektronisch) Akku Typ AFP 3/ (electronically controlled), battery powered, type AFP	SANHA Pressmax (elektronisch)/(electronically controlled) 15 -35 mm	
Mannesmann	Elektromechanische Presswerkzeug/Electro-mechanical crimping tool Typ/Type EFP 1 (bis 1995) Typ/Type EFP 2 (ab1996)	Mannesmann Pressbacken/Dies 15 -54 mm Mannesmann Pressbacken/Dies 15 - 54 mm	* Achtung: Pressschlingen für 42 - 54 mm sind nicht verwendbar * Note: Press collars for 42 to 54 mm cannot be used.
Viega	Viega Systempresswerkzeug Elektro-Hydraulisch/ Viega system crimping tool, electro-hydraulically controlled Typ/Type EFP 1 (bis 1995) Typ/Type EFP 2 (ab 1996)	Viega Pressbacken für Profipress und Sanpress 15 - 54 mm/ Viega dies for Profipress and Sanpress 15 – 54 mm	
REMS	REMS-Power-Press Antriebsmaschine/ REMS Power Press drive unit	REMS Presszangen/crimping tools SV V M SA	 15 - 54 mm 15 - 54 mm 15 - 54 mm 15 - 35 mm
REMS	REMS-Akku-Press Antriebsmaschine/ Akku Press drive unit	REMS Presszangen/Dies SV V M SA	 15 - 54 mm 15 - 54 mm 15 - 54 mm 15 -35 mm
Rothenberger	Vasrio-Press 1000 APC elektromechanisches Presswerkzeug/ electro-mechanical crimping tool	Vario Pressbacken/Dies SV M	 15 - 54 mm 15 - 35 mm

Technische Änderungen vorbehalten
-Subject to technical modifications

Rohre

Rohre aus Edelstahl 1.4401 mit folgenden Kenndaten: Rohre geschweißt 1.4401/1.4404 nach Werksnorm 1.110.00 blank, spannungsfrei und lösungsgeglüht (1070 °C)

Tubing

Tubing of stainless steel 1.4401 with the following characteristics: welded tubes of 1.4401/1.4404 as per company standard 1.110.00, bright metal, stress-free ans solution annealed (1070 °C)

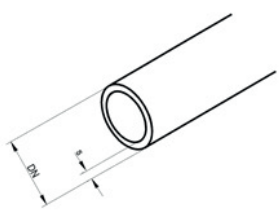
Nennweite Nominal width mm	Außendurchmesser Outside diameter mm	Wanddicke Wall thickness mm	Mindesteinstecktiefe Minimum insertion depth mm	Wasserführende Fläche Water-conducting surface cm²	Durchflussmenge bei v = 2 m/s Flow volume at v = 2 m/s l/min
10,0	12,0		23,0	0,8	10,2
12,0	15,0		23,0	1,3	15,6
15,0	18,0		23,0	2,0	24,0
20,0	22,0		26,0	3,0	36,0
25,0	28,0		27,0	5,1	61,0
32,0	35,0		28,0	8,0	96,0
40,0	42,0		36,0	12,0	144,0
50,0	54,0		42,0	20,4	245,0
60,0	63,5		60,0	28,7	345,0
80,0	84,0		80,0	51,5	618,0
100,0	104,0		100,0	80,1	961,0

1) Die Rohre werden auch in Ringen à 25 m geliefert. Die Rohre werden in Stangen mit einer Länge von 6 m geliefert.
1) The pipes can also be delivered in rings of 25m. The pipes are delivered cut to a length of 6m.

Rohr P110

Tube P110

Stange 6 m lang
Bar 6 m long



Abmessung Dimension	DN mm	s mm	kg/m	Länge/Length m/Bund/Bunch	kg/Bund/Bunch
DN 12	12	0,7	0,19	1014	202,0
DN 15	15	1,0	0,35	1014	357,0
DN 18	18	1,0	0,43	762	325,0
DN 22	22	1,2	0,63	762	478,0
DN 28	28	1,2	0,81	546	441,2
DN 35	35	1,5	1,26	270	340,7
DN 42	42	1,5	1,53	120	183,1
DN 54	54	1,5	1,98	60	118,7
DN 60	60	1,5	2,34	60	140,4
DN 80	80	1,5	3,12	30	93,5
DN 100	100	1,5	3,87	30	116,0