VSH
Connection technology

XPress GAS
Technical Manual

Distributed by:

KE KELIT®
NEW ZEALAND

VSH XPress GAS
Technical Manual

Distributed By

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CODEMARK
CM70044

The VSH XPress GAS range distributed by KE KELIT New Zealand are CodeMark certified products. They are proven to comply with all relevant performance requirements of the New Zealand Building Code.

Disclaimer:

The technical data are non-binding and not expressly warranted characteristics of the products. These are subject to change. Please consult our General Terms and Conditions of Supply. Additional information is available upon request. It is the Designer's responsibility to select products suitable for the intended purpose and to ensure that pressure ratings and performance data are not exceeded. Always read and understand the installation instructions. Never remove any piping components nor correct or modify any piping deficiencies without first de-pressurising and draining the system. This technical handbook is based on European regulations; local regulations must always be adhered to.

Product Technical Specification:

Please refer to: VSH XPress GAS distributed by KE KELIT NZ Australasia Technical Specification (Rev 1: March 2018)

Contents

VSH XPress GAS Systems

The VSH XPress GAS product range, distributed by KE KELIT NZ is made up of two systems: Stainless steel press fittings and pipe, and copper press fittings and pipe that are purpose built for gas applications. VSH XPress GAS fittings incorporate an “M” profile.

VSH XPress GAS products are manufactured using unique, modern machinery. The completely automated factory guarantees you safe, high-quality products. All VSH XPress GAS products have a batch identification to track the origin of the raw material and supplier. Mill certificates are available upon request.

VSH XPress GAS systems are suitable for gas applications at -20°C to 70°C.

- Sizes 15mm – 108m for stainless steel gas fittings
- KE KELIT STEELFIX stainless steel 316 piping is available
- Sizes 15mm – 108mm for copper gas fittings
- KE KELIT COPPERFIX hard and half-hard copper piping is available
- Suitable for Natural Gas and LPG applications

Installations are a minimum of 3x faster than traditional systems, as no threading or welding is required.

Advantages of the VSH XPress GAS Systems

- Professional and appropriate pressure tools
- Simple, fast connection technology
- 2 materials available
- Stainless steel gas fittings from 15 mm to 108 mm
- Copper gas fittings from 15 mm to 108 mm
- Systems: stainless steel for gas and copper for gas
- Clear identification of materials and dimensions

The VSH XPress GAS systems offer installers a complete solution with great flexibility. The VSH XPress GAS systems consist of fittings, tools and pipe. The VSH XPress Stainless Steel GAS fittings can be used with stainless steel pipe that fits the specifications given on Suitable Stainless Steel Pipes on page 10. The VSH XPress Copper GAS fittings can be used with copper pipe that fits the specifications given on Suitable Copper Pipes on page 12. KE KELIT NZ supply STEELFIX stainless steel (AISI 316) piping and COPPERFIX copper piping which meet the respective specifications. Furthermore, the VSH XPress GAS fittings can also be used with various brands of press tools which you can find more info on page 17.

Performance Guaranteed

We guarantee consistent quality and supply, with all fittings being manufactured in Europe. In order to ensure high-value manufacturing, Aalberts integrated piping systems employs laser-welding technology and all welded fittings undergo 100% leak testing. The leak testing is fully automated and incorporated in the laser-welding process. Where possible, straight connectors with a threaded end and reducers are made from a single piece so that there is no risk of leakage and it is more compact for recessed pipe work. Good performance is guaranteed. The smooth outer surface of the pipes and fittings means that the flow characteristics are better than with traditional connection systems. The quality of VSH XPress fittings is also testified for by a number of national and international approvals. A wide range of system and product tests are available, with certificates for gas installations.

Reliable

With VSH XPress GAS systems, the quality of the connection is mainly determined by the tool and not the installer, thereby considerably reducing the risk of errors during installation. Once pressed, the system is guaranteed to be airtight and watertight.

Easy and Clean

Compared to other “cold” connection methods, VSH XPress GAS is an extremely user-friendly solution:

- The use of VSH XPress GAS systems dispenses with the need for complicated clamping techniques, time-consuming preparations and drying times – the installation is faster and cleaner;
- No need to thread the pipe;
- No lubrication needed for installation;
- Easy insertion of the pipe in the fitting due to the special design of the fittings
- Short radius bends ensure compact and space-saving installation.

The above features ensure that no special welding skills are required for an installation and that the work can be carried out in a pleasant and safe environment.

Safe

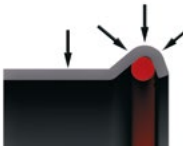
The installation of VSH XPress GAS systems does not require any heat source (as, for example, with welding or brazing) or other heavy and potentially dangerous tools. This feature makes VSH XPress GAS the ideal solution for repairs or renovation projects, since you can ensure a minimum of disturbances at the site and you do not require hot works permits. Moreover the light weight of the precision stainless steel pipe means labour conditions are still further improved and a contribution made to a healthier way of working.

Fast

This simple, fast connection technology and the short preparation times for the piping connections result in further considerable cost savings in the installation. As the connection is only achieved using press tools, no other materials, such as gases, adhesives, threading machines, etc., need to be purchased or hired.

VSH XPress GAS - “An imPRESSive Solution!”

Advantages of M-profile

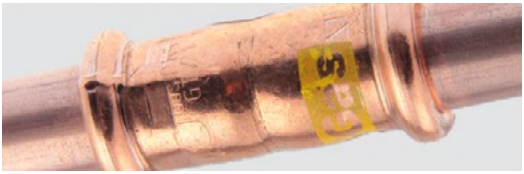


- The O-ring is pressed perpendicularly into the pipe. This results in a seamless transition between fitting and pipe that prevents leakages and any dust or dirt from getting into the joint.
- The O-ring bead creates an extra mechanical connection between fitting and pipe.
- During the pressing, pressure is applied to the O-ring from three angles, which results in a robust deformation of the O-ring bead and an extremely secure connection.
- Due to the positioning of the O-ring at the beginning of the fitting, the O-ring can be clearly seen and easily checked by the installer. This results in a safer installation process as any damage can be immediately spotted; the same is true if the ring is wrongly placed.
- No chances of leakage due to the very accurate press profile (M-profile).

Advantages of VSH XPress GAS Systems

The VSH XPress GAS systems are a complete range of fittings, pipe and tools. The fittings and pipes are easily recognisable based on their markings. The VSH XPress GAS jaws and slings can be recognised by the “X” symbol that appears on the surface of the fitting after pressing. There are major benefits to be gained by using VSH XPress GAS systems (fittings, pipe and tools).

- You are always ensured that the combination of fittings, pipe and tools are an optimal match and ensure high quality connections.
- The “X” immediately shows you that the jaws and slings used are the correct choice for the job. It gives you a 100% guarantee that those jaws and slings match the VSH XPress GAS system.
- In order to prevent dirt from getting into the pipe, all pipes are delivered with coloured end-caps.



References

VSH XPress is being used all over the world in the widest range of applications and different building types.

Technical Data

Areas for Using VSH XPress GAS Systems

Gas Installations	
VSH XPress Stainless Steel & Copper GAS fittings with stainless steel pipes that satisfy DVGW worksheet VP614, SVGW Data sheet G1/01 and ÖVGW PG 314.	
O-Rings	HNBR* (Yellow)
Operating Temperature:	-20°C to +70°C
Operating Pressure:	Max. 5 bar inside and outside
Application:	Inside (HTC**, proven tightness of the connection at 650°C for 30 min) or outside buildings. During construction and in concrete, above and under screed within buildings, corrosion protection is recommended (see page 59). Outside of buildings, only lay above ground. Local regulations must always be observed.

Important: R220 is NOT approved for gas.

VSH XPress GAS Pipes

Pipes used in VSH XPress GAS systems are thin-walled precision pipes. The outer and inner surfaces of the pipe are blank, free of discolouration and are supplied free of manufacturing residue that could otherwise cause corrosion. The possibility of any dirt or dust getting into the pipe during transport or when stored is avoided by caps on both ends of the pipe and correct packaging for distribution. This section gives you all the relevant technical parameters for suitable piping.

Suitable Stainless Steel Pipes

The stainless steel pipes that may be used for the VSH XPress Stainless Steel GAS system in gas applications must satisfy DVGW worksheet VP614, SVGW Data sheet G1/01 and ÖVGW PG 314. KE KELIT NZ supply STEELFIX stainless steel 1.4401 (AISI 316) pipe in the 15 - 108 mm size range which is suitable for use with VSH XPress Stainless Steel GAS fittings. These pipes are manufactured to the specifications of EN 10312 – DVGW – Worksheet GW541 (2004) *Table 2*. STEELFIX stainless steel (316) pipes have been approved for gas installations inside buildings, and outside buildings above ground (not under screed or underground when installed outside of buildings).

* Hydrogenated Nitrile Butadiene Rubber
** Higher Thermal Capacity

Fire characteristics

STEELFIX stainless steel (316) pipes are considered as non-combustible pipes according to German class A building materials – EN 13501-1

Applications

The installations must always comply with local regulations.

- Special installations for combustible gases (fittings require special O-rings, see page 10): natural and liquid gases, in accordance with DVGW – Worksheet G260 I/II. Piping for gas or liquid gas, in accordance with DVGW-TRGI 2018 and DVFG-TRF 2012.

Table 1: Technical Characteristics of STEELFIX Stainless Steel Pipe 1.4401

Material	X5CrNiMo 17 12 2 material no. 1.4401 in accordance with DIN-EN 10088
Specifications	EN 10312 – DVGW - Worksheet GW541 (2004) *table 2*
Approvals	ÖVGW, DWGW, SVGW, ETA, BYGGFORSK, STF, PZH, SITAC, CST Bat, WRAS, VS, FM, FG, CNBOP, SBSC, SETSCO, LPBC, DNV, GL, RINA, UL, ULc, BV, GDV
Type of Pipe	TIG or laser-welded
Welding Seam	100% EDDY CURRENT tested in accordance with EN 108932:2011
Weld Slag Removal	Outside
Tolerances	In accordance with EN10312 - *table 2*
Finish	Annealed under a protective atmosphere W2R
Surface Finish	Matt silver
Marking	steelFIX Edelstahlrohr/stainless steel 1.4401 ø22x1.2 mm OVGW W1.477 TW 110°C/max.16bar EN10312 VdS G411013 [batch number or production date] [supplier code] KE KELIT
Small Bend Radius	3.5 x external diameter of the pipe (max. 28 mm)
Form Delivered	Pipes, length 6m +0/-50 mm, with protective caps (green)
Heat Expansion Coefficient	0.0160 mm/m at ΔT= 1K
Max. Working Pressure	16 bar

Table 2: Dimensions and Weight of STEELFIX Stainless Steel Pipe 1.4401				
DN	Outside Ø x s [mm]	Inside Ø [mm]	Weight [kg/m]	Tube Capacity [L/m]
DN 12	15 x 1.0	13.0	0.333	0.133
DN 15	18 x 1.0	16.0	0.410	0.201
DN 20	22 x 1.2	19.6	0.624	0.302
DN 25	28 x 1.2	25.6	0.790	0.515
DN 32	35 x 1.5	32.0	1.240	0.804
DN 40	42 x 1.5	39.0	1.503	1.195
DN 50	54 x 1.5	51.0	1.972	2.043
DN 65	76.1 x 2.0	72.1	3.550	4.548
DN 80	88.9 x 2.0	84.9	4.150	5.661
DN 100	108 x 2.0	104.0	5.050	8.495

Suitable Copper Pipes

The copper pipes that may be used for the VSH XPress Copper GAS system in gas applications must comply with the norm EN 1057 R250/R290. KE KELIT NZ supply COPPERFIX EN 1057 R250/R290 copper pipe in the 15 - 108mm size range which is suitable for use with VSH XPress Copper GAS fittings. EN 1057 is the norm for seamless copper and copper alloyed pipes for potable water, gas and heating installations. A distinction is made between soft, medium-hard and hard alloy pipes, identified R220, R250 and R290 (i.e. tensile strength in N/mm2). The higher the figure, the harder the metal is. R220 copper pipe is not allowed for gas installations.

Fire characteristics

Uninsulated copper pipes certified according to EN 1057/DVGW are considered as non-combustible pipes according to German class A building materials – EN 13501-1.

Applications

The installations must always comply with local regulations.

- Gas installations (fittings require special O-rings, see page 10)

Table 3: Technical Characteristics of Approved Copper Pipes	
Material	DHP copper material no. CW 024A in accordance with DIN EN 1412
Outside Ø Tolerance	EN 1057
Tensile Strength	R250 - medium-hard - 250 N/mm² R290 - hard - 290 N/mm²
Smallest Bend Radius	3.5 x external diameter of the tube (down to 10°C)

Table 4: Copper Pipes Suitable for use with VSH XPress Copper GAS Fittings

Copper Pipes in Accordance with EN1057 R250/R290								
Outside Diameter (mm)	Wall Thickness							
	0.7	0.8	0.9	1.0	1.2	1.5	2.0	2.5
15	R250*							
18		R250*		R250				
22			R250*	R250				
28			R250**	R290	R250	R290		
35					R290*	R290		
42					R250 R290*	R290		
54					R250 R290*		R290	
66.7					R290*		R290	
76.1						R290*	R290	
108						R290*		R290

* KE KELIT COPPERFIX Copper Pipe
** KE KELIT COPPERFIX Copper Pipe

VSH XPress GAS Fittings

Approvals

VSH XPress GAS fittings are tested and approved for gas installations. The approvals held are listed in the following table:

Approvals	VSH XPress Stainless Steel GAS	VSH XPress Copper GAS
DVGW	15 - 108mm	15 - 54mm
BSI	15 - 108mm	15 - 108mm
ÖVGW	15 - 108mm	15 - 54mm
SVGW	15 - 108mm	15 - 54mm

Technical Characteristics

VSH XPress Stainless Steel GAS fittings are produced from 1.4404 materials, in accordance with DIN 10088 and are fitted with a “yellow” HNBR O-ring.

The sizes 15 - 108 mm of VSH XPress Stainless Steel GAS for gas installations must be pressed using appropriate tooling. The sizes 76.1 - 108 mm VSH XPress Stainless Steel GAS fittings must be pressed using a Novopress ECO301 or ACO203XL. The sizes 15 - 108mm for VSH XPress Copper GAS for gas installations can be pressed using Novopress press tools. Press tools, jaws and slings of other suppliers may be authorised under local approvals - See page 17 for further details.

Threaded Fittings

The VSH XPress GAS product range includes components with inner and outer threads. VSH XPress GAS fittings with inner and outer threads are manufactured in accordance with DIN 2999/ISO 7/1. Hemp or other chloride-free sealants are suitable for the threads of VSH XPress Stainless Steel GAS fittings. PTFE sealing tape may not be used in conjunction with stainless steel due to the water-soluble chloride ions it contains. With threaded couplings, we recommend that the sealing be executed before the pressing, in order not to stress the press connection.

Screw Fittings (Copper)

The manufacturers of gas heating appliances supply their products with the respective screw connections in place. G6360-type “half screw fittings” may, therefore, be used as press connections to already-present screw connections. The half screw fitting (G6360), as well as the G6340 screw fitting with a double-sided press end, is also approved in accordance with DIN 3436 HTC.

Bronze Threaded Transition Fittings

Threaded transition fittings are generally manufactured from gun metal. A distinction is made

in this case between strand or continuous casting (straight joints) and mould casting (bends, T-pieces and wall plates). Tests have shown that mould cast (sand cast) press fittings are less suitable for gas applications for the following reasons: mould casting joints can never be as leak-proof (homogeneous) as strand cast or copper ones. There is always, in particular, a danger of air cavities despite 100% impermeability testing. Additionally, the mechanical load of the pressing heightens these dangers as it may cause cavities to burst open. Therefore, for safety reasons, no mould-cast parts are included in the VSH XPress Copper GAS press fitting range.

VSH XPress Stainless Steel GAS Fittings		
	Marking	Packaging Label
	Yellow Marking GAS, GT5/MOP5 316L XPress Dimension DVGW	Type R.....G Dimension Description EAN No. Art. No. Approvals Quantity

VSH XPress Copper GAS Fittings		
	Marking	Packaging Label
	XPress Yellow marking GAS, GT1/PN5 MOP 5 T2 DVGW, Qa Dimension	Type G..... Dimension Description EAN No. Art. No. Approvals Quantity

Hydrogenated Nitrile Butadiene Rubber (HNBR) for VSH XPress Stainless Steel & Copper GAS		
	Temperature	Applications
	-20°C to +70°C	Installations for combustible gases: natural gases and liquid gases in accordance with Worksheet DVGW G260 I/II. Installations for natural gas in accordance with Worksheet DVGW - TRGI 2018, and liquid gases in accordance with DVFG - TRF 2012

Important: O-rings used for gas applications DO NOT have a leak before pressed function for safety reasons.

Alternative VSH XPress GAS Applications

The choice of fittings and pipes depends on what the purpose of the system is, the medium and the operating conditions. Please contact KE KELIT NZ regarding approval for any applications other than natural gas or LPG. Installations must always comply with local regulations.

(Main) Equipotential Bonding in Residential Premises

All metal tubing systems using equipotential bonding must comply with equipotential bonding requirements. Continuity checks must be conducted by a qualified electrician in accordance with the regulations, once the installation work has been finished. STEELFIX stainless steel (316) pipes and COPPERFIX copper pipes used in combination with the respective VSH XPress GAS fittings are electrically conductive pipe systems and, therefore, must be included in the equipotential bonding.

Press Tools

Fig. 1: Novopress ACO203XL Press Tool

Press tools consist of a press machine and the corresponding press jaws or slings. The press machine can be either battery or electrically powered. *Figure 1* shows a battery-powered version. The corresponding press jaws and slings must be used for each diameter of pipe in the system in order to achieve a perfect connection. *Figure 2* shows a cross section of the press profile before and after pressing.

All VSH XPress GAS fittings with a diameter from 15mm to 108mm can be pressed using the appropriate press tools listed in our product range. You must use the M-profile jaws or slings that correspond to the diameter to be installed. A special adaptor may also be required in addition to the press slings for diameters of 42 to 108 mm.

Important: VSH XPress GAS fittings may only be pressed with the press jaws/slings approved by KE KELIT NZ. VSH guarantees an excellent press connection, provided the tools are used correctly.

Before Pressing After Pressing

Fig. 2: Before and After Pressing

For a list of approved press tools for the VSH XPress GAS piping system, please contact KE KELIT NZ or visit www.aalberts-ips.eu.

Maintenance and Correct Usage of Press Tools

Correct pressing with the VSH XPress GAS systems is guaranteed when the press tools are used correctly. Regular maintenance and lubrication of the press jaws, slings and tools is necessary. Please observe the manufacturer's instructions for use and maintenance. When jointing VSH XPress GAS fittings larger than 35mm, it is essential that the grooves in the press jaw/sling be lubricated with Dri-slide lubricant! As a guide the jaws/slings should be lubricated in this way after every 50 joints for sizes 42-54mm, every 15 joints for sizes 76.1-88.9mm, and every 5 joints for 108mm. Note that care must be taken to avoid any contact between lubricant and 'O-rings'. Badly maintained and/ or damaged press jaws pose a potential risk. Damaged jaws can damage the fittings, leaving metal particles behind in the jaw as a result. If the same jaw is then used to press a stainless steel fitting, these metal particles will be pressed into the fitting, which could lead to pitting and further corrosion. Therefore, always make sure that press jaws and slings are properly cleaned when switching between materials.

Installation Guidelines

Cut the Pipe to Length

After measuring, pipes can be cut to length using a pipe cutter *(see Fig. 3)*, a fine-toothed handsaw or a mechanical saw with electrical motor suitable for the pipe material. The pipe must always be cut completely through. Never partially cut the pipe and break it off as this could cause corrosion.

Do not use oil-cooled saws, grinding wheels or flame cutters.

Fig. 3: Cutting the Pipe

Deburring the Pipe

The pipe ends must be carefully and thoroughly deburred inside and out after being cut to length. This is in order to avoid any damage to the O-ring when inserting the pipe into the press fitting. Deburring the inside of pipes prevents pitting and corrosion. A hand deburrer suitable for the material or an electrical pipe deburrer may be used to deburr both the inside and outside of the pipe. Burrs sticking to the pipe must be removed.

Fig. 4: Deburring the Pipe

Calibration

Always ensure the pipe ends are radial and evenly rounded-off. The pipe ends must be calibrated before pressing.

Marking the Insertion Depth

The required insertion depth (see *table 6A*) must be marked on the pipe or the press fitting (the latter for fittings with pipe ends) in order to guarantee a safe and proper joint. Mark the insertion depth using the insertion depth marker for VSH XPress GAS. Reliable pressing with the corresponding tensile strengths can only be achieved if the elements are correctly installed. The pressing operation behind the bead is of crucial importance for the tensile strength.

Fig. 5: Marking Insertion Depth

The marking on the pipe must remain visible (but as close to the fitting as possible) after the connection is pressed to identify any movement before or after pressing.

Check the Fitting and Pipe

Before assembly, the fitting must be checked to ensure that the O-rings are present and correctly positioned. The pipe, fitting and O-ring must be examined for any foreign materials (e.g. dirt, burrs), which must be removed, if present.

Fig. 6: Checking Fitting/Pipe

Assembly of Fitting and Pipe

Insert the pipe carefully into the press fitting up to the marked insertion depth, simultaneously rotating and pushing it in the direction of the axis. The insertion depth marking must remain visible. In the case of fittings without a stop the fittings should be inserted as far as the marked insertion depth. Rough and careless insertion of the pipe into the press fitting may result in damage to the O-ring and is therefore not permitted.

Fig. 7: Assembly of Fitting/Pipe

If assembly is difficult because of the permitted tolerances in size, a lubricant, such as water or soap, may be used. Under no circumstances may oils, fats or grease be used as lubricants. To optimise the installation time, time may be saved by first assembling a number of connections and then pressing the various pipe connections one after the other. Marking the distance (A) provides a check that the pipe has not been pushed out of the fitting during the pressing process. Before starting the final pressing process of the various pipe connections, it is also important to check the minimum required distances for the installation (see *table 6A* on the following page).

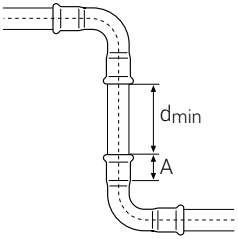


Fig. 8: Distance Between Fittings

Table 6A: Minimum Distances Between Pressings

	Insertion Depth		Minimum Distance	Minimum Tube Length	
	A (mm)		dmin (mm)	2xA + dmin (mm)	
Ø [mm]	VSH XPress Stainless Steel GAS	VSH XPress Copper GAS	VSH XPress GAS (Copper & Stainless Steel)	VSH XPress Stainless Steel GAS	VSH XPress Copper GAS
15	20	20	10	50	50
18	20	20	10	50	50
22	21	21	10	52	52
28	23	23	10	56	56
35	26	26	10	62	62
42	30	30	20	80	80
54	35	35	20	90	90
76.1	55	50	55	165	155
88.9	63	64	65	191	193
108	77	64	80	234	208

Table 6B below gives the minimum required working space so that the pressing of the fittings can be carried out correctly using the appropriate press tools. These distances relate to the general installation configurations that are schematically depicted in *Figures 9-11*.

Table 6B: Space Needed for Installation (* slings)

Outside Ø	Fig. 9		Fig. 10				Fig. 11
	a	b	a	b	c	d	Pipe Depth
15	56	20	75	25	28	131	40 mm
18	60	20	75	25	28	131	40 mm
22	65	25	80	31	35	150	40 mm
28	75	25	80	31	35	150	60 mm
35	75	30	80	31	44	170	70 mm
42	140/115*	60/75*	140/115*	60/75*	75	265	70 mm
54	140/120*	60/85*	140/120*	60/85*	85	290	70 mm
76.1	140*	110*	165*	115*	115	395	80 mm
88.9	150*	120*	185*	125*	125	435	90 mm
108	170*	140*	200*	135*	135	470	100 mm

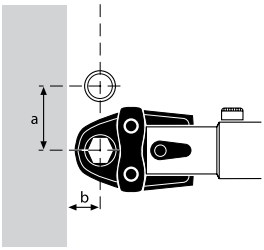


Fig. 9

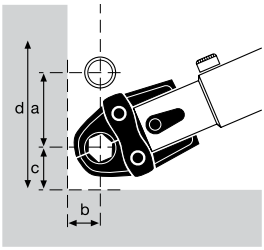


Fig. 10

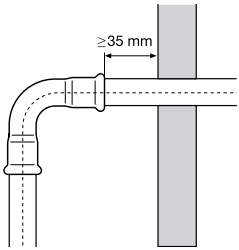


Fig. 11

Pressing

Before starting to press, the press jaws and slings must be checked for dirt, which must be removed if present. Furthermore, the press machine must be in good condition and the instructions for operating the device, maintenance and the manufacturer's instructions must be observed. Make sure that you are using the correct press jaws and slings. In order to create a correctly pressed connection, the groove of the press tool must enclose the press fitting O-ring bead. Once the pressing has started, always complete the press cycle and under no circumstances interrupt the process.



Important: It is not permitted to press a connection more than once.

Pressing Gas Installations

The VSH XPress Stainless Steel GAS and VSH XPress Copper GAS systems are suitable for gases of the second and the third gas family (natural and liquid gases) in accordance with DVGW Worksheet G 260 and are installed inside buildings and above ground outside buildings.

A combination of VSH XPress Copper GAS and VSH XPress Stainless Steel GAS systems is not permitted for new installations. Connections to gas fittings and gas parts in brass, bronze, ductile grey cast iron and die cast aluminium may be connected with gas thread/ press fittings or flanges. If renovations or repairs are being carried out, make sure the pipes are in accordance with the DIN-EN/DVGW standards, have perfect, undamaged outer surfaces and have not been painted. VSH XPress Copper GAS has been certified by Gastec QA and by KVGB (Ø15 – 28mm). VSH XPress Copper GAS fittings are NOT allowed to be used in combination with soft copper pipe EN1057 R220.

Local regulations must always be observed (e.g. NZS 5261:2003 and AS/NZS 5601.1:2013):

1. Gas pipes and fittings must be marked yellow to avoid confusion.
2. Pipes must be protected during construction against mechanical damage.
3. Carry out tests according to Appendix E of AS/NZS 5601.1:2013.
4. When laid under screed (above the reinforcement), place in concrete slots.
5. Operating temperature: -20°C to +70°C

Bending Pipes

It may be necessary to bend a pipe in order to carry out the installation. Normal hand, hydraulic or electrically-operated pipe benders with the corresponding bend formers can be used for this. The manufacturer will determine the suitability of the bending tool. Approved stainless steel pipes and copper pipes may be bent cold, in accordance with DIN EN 1057.

Important: The pipe may not be bent went warm due to the danger of corrosion

The Smallest Bending Radius is as Follows:	
Stainless Steel Pipes (15 - 28mm)	rmin = 3.5 x d
Copper Pipes (15 - 54mm)	rmin = 3.5 x d
A smaller bending radius is not permitted.	

Thermal Expansion (In The Piping System)

The level of thermal expansion within piping systems depends on the type of materials used. This linear expansion needs to be taken into account during the installation. Small changes in length can be accommodated by having adequate space for expansion as well as by the elastic properties of the piping system itself. More substantial changes in length need to be offset by other means; e.g. installation of special expansion compensation devices, fixed anchoring points and brackets.

Equation for calculating the changes in length:

$$\Delta l = l \times \alpha \times \Delta T$$

Δl = total linear expansion [mm]

l = length of segment in question [m]

ΔT = temperature difference [K]

α = linear expansion coefficient, where:
For STEELFIX stainless steel pipe 1.4401 α = 0.0160 mm/mK
For COPPERFIX copper pipe α = 0.0170 mm/mK

Expansion can be offset by the use of a pipe segment *(Figures 12, 13)*, U-bend *(Figure 14)* or compensators. The level of expansion to be offset can be determined beforehand by calculating the changes in length.

Tables 7A and 7B show the expansion of the pipeline depending on the length of the pipe and the rise in temperature.

Table 7A: Linear Expansion Δl [mm]. Only for Stainless Steel 1.4401

l [m]	ΔT [K]									
	10	20	30	40	50	60	70	80	90	100
1	0.16	0.32	0.48	0.64	0.80	0.96	1.12	1.28	1.44	1.60
2	0.32	0.64	0.96	1.28	1.60	1.92	2.24	2.56	2.88	3.20
3	0.48	0.96	1.44	1.92	2.40	2.88	3.36	3.84	4.32	4.80
4	0.64	1.28	1.92	2.56	3.20	3.84	4.48	5.12	5.76	6.40
5	0.80	1.60	2.40	3.20	4.00	4.80	5.60	6.40	7.20	8.00
6	0.96	1.92	2.88	3.84	4.80	5.76	6.72	7.68	8.64	9.60
7	1.12	2.24	3.36	4.48	5.60	6.72	7.84	8.96	10.08	11.20
8	1.28	2.56	3.84	5.12	6.40	7.68	8.96	10.24	11.52	12.80
9	1.44	2.88	4.32	5.76	7.20	8.64	10.08	11.52	12.96	14.40
10	1.60	3.20	4.80	6.40	8.00	9.60	11.20	12.80	14.40	16.00
12	1.92	3.84	5.76	7.68	9.60	11.52	13.44	15.36	17.28	19.20
14	2.24	4.48	6.72	8.96	11.20	13.44	15.68	17.92	20.16	22.40
16	2.56	5.12	7.68	10.24	12.80	15.36	17.92	20.48	23.04	25.60
18	2.88	5.76	8.64	11.52	14.40	17.28	20.16	23.04	25.92	28.80
20	3.20	6.40	9.60	12.80	16.00	19.20	22.40	25.60	28.80	32.00

Table 7B: Total Linear Expansion ΔI [mm]. Only for Copper.										
l [m]	ΔT [K]									
	10	20	30	40	50	60	70	80	90	100
1	0.17	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70
2	0.34	0.68	1.02	1.36	1.70	2.04	2.38	2.72	3.06	3.40
3	0.51	1.02	1.53	2.04	2.55	3.06	3.57	4.08	4.59	5.10
4	0.68	1.36	2.04	2.72	3.40	4.08	4.76	5.44	6.12	6.80
5	0.85	1.70	2.55	3.40	4.25	5.10	5.95	6.80	7.65	8.50
6	1.02	2.04	3.06	4.08	5.10	6.12	7.14	8.16	9.18	10.20
7	1.19	2.38	3.57	4.76	5.95	7.14	8.33	9.52	10.71	11.90
8	1.36	2.72	4.08	5.44	6.80	8.16	9.52	10.88	12.24	13.60
9	1.53	3.06	4.59	6.12	7.65	9.18	10.71	12.24	13.77	15.30
10	1.70	3.40	5.10	6.80	8.50	10.20	11.90	13.60	15.30	17.00
12	2.04	4.08	6.12	8.16	10.20	12.24	14.28	16.32	18.36	20.40
14	2.38	4.76	7.14	9.52	11.90	14.28	16.66	19.04	21.42	23.80
16	2.72	5.44	8.16	10.88	13.60	16.32	19.04	21.76	24.48	27.20
18	3.06	6.12	9.18	12.24	15.30	18.36	21.42	24.48	27.54	30.60
20	3.40	6.80	10.20	13.60	17.00	20.40	23.80	27.20	30.60	34.00

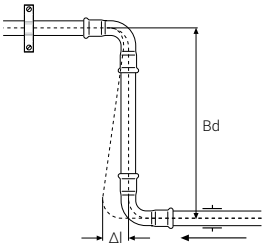


Fig. 12

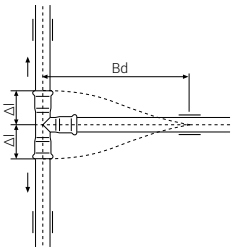


Fig. 13

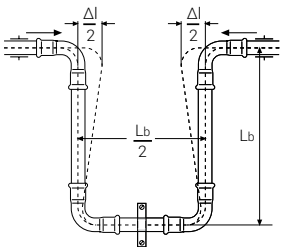


Fig. 14

Calculation of the Expansion Length to be Allowed for:

In the case of major expansion, expansion compensators or, in complicated cases, Ω-shaped compensation loops will need to be determined and fitted. The compensation (in mm) can be calculated for different situations with the following formulas:

Figure 12	Figure 13	Figure 14
Bd = k x √(de x Δl)	Bd = 1.44 x k x √(de x Δl)	Lb = Bd / 1.8 = k x √(de x Δl)/ 1.8

- **Bd** = expansion compensator length *(Figures 12 and 13)*
- **Lb** = depth of Ω-shaped expansion compensator *(Figure 14)*
- **k** = material constant
  = 45 for STEELFIX stainless steel (316 pipes)
  = 35 for COPPERFIX copper pipes
- **de** = external diameter of the pipe [mm]
- **Δl** = linear expansion that needs to be compensated [mm]

The nomogram in *Graph 1* enables the expansion bend length [Bd] for *Figure 12* to be rapidly and accurately determined by taking account of the respective pipe types and the expansion to be compensated [Δl]. For the situation in *Figure 13*, multiply the Bd value from *Graph 1* by 1.44 to determine the expansion compensation length. *Graph 2* gives the Lb values for the installation situation illustrated in *Figure 14*.

The following is an example of an analytical calculation: A pipe network with a length of 16 m consisting of STEELFIX stainless steel 1.4401 piping with a diameter of 22 mm is subject to a temperature difference of 60 K. If we use the equation for calculating the expansion, the result is: **Δl = 16 x 0.0160 x 60 = 15.36mm**

We would get the same result from the data in *table 7A* without having to perform the calculation. In addition to the expansion for the respective section of the pipeline, we need to calculate the length of the expansion compensator required for its compensation – *see Figure 12*. Using the nomogram in *Graph 1*, we obtain approx. 830mm. The analytical calculation gives the following result: **Bd = 45 x √(22 x 15.36) = 827.2mm**

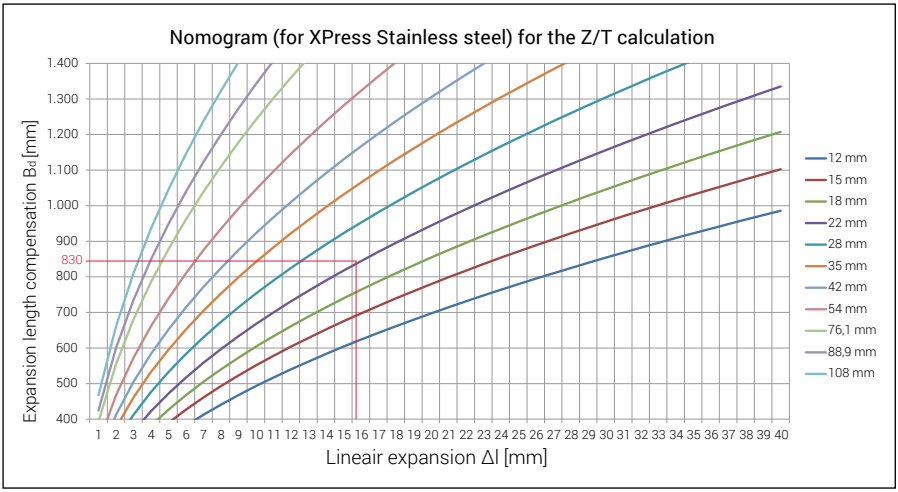
In the case of an Ω-shaped expansion connection, the calculated value of an expansion equalizer [Lb] as in *Figure 14* has to be approximately halved as it is effectively two expansion sections. The value [Bd] does not have to be divided exactly by two, but should be divided by a factor of 1.8: Lb = **Bd/1.8 = 827.2/1.8 = 459.6mm**

Or otherwise: **Lb = 25 x √(22 x 15.36) = 459.6mm**

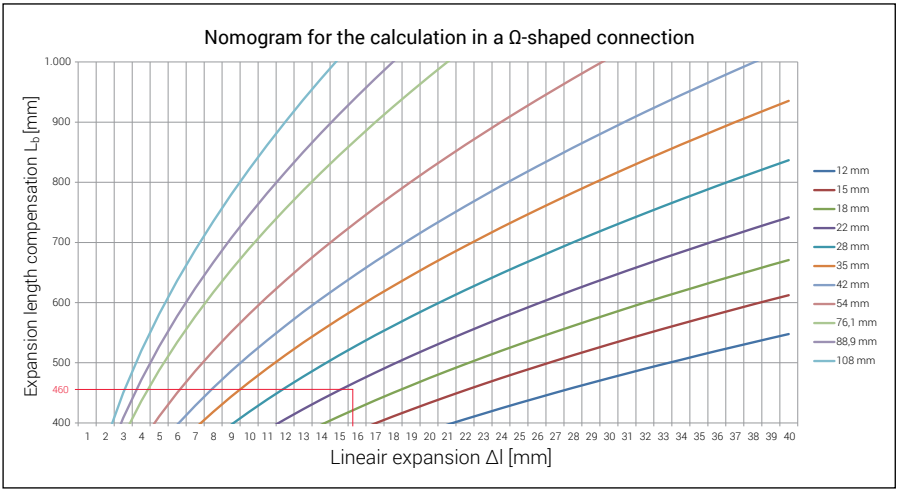
Graph 2 shows a value for Lb of approx. 460 mm.

As can be seen clearly in *Figures 12-14*, the correct compensation of the expansion depends also on the placement of fixing devices, such as brackets and anchoring points. Never plan to (or actually place) fixed pipe mounting clips close to a pipe connection. The clips should

be positioned so that they do not act as a fixed restraint. When there are straight segments of pipe, without expansion compensation, use only one saddle clip to prevent possible deformation. Position it as close to the middle of the straight segment as possible. In this way, any expansion will be distributed in both directions and the length of the expansion equaliser required will be halved. It is recommended that pipe clips with a rubber inlay be used as this will muffle any possible noise and vibrations and better distribute stresses.



Graph 1: *Nomogram (for STEELFIX Stainless Steel) for Calculating the Situations in Figures 12 & 13. Expansion bd [mm]*



Graph 2: *Nomogram for Calculating the Situation in Figure 14. Compensator Lb [mm]*

Pressure Drops in Gas Installations

Pressure Drops (In The Piping System)

When gas flows through a piping system it experiences continuous and local flow resistances that are apparent from the pressure drop in the system. There is a difference between continuous and local pressure drops. The continuous pressure drop is mainly caused by the flow resistance in straight tube sections, which in turn essentially results from the friction between the gas and the pipe wall. Local pressure drops, on the contrary, are those flow resistances that are caused by turbulence, for instance where there is a change of internal pipe diameter, a tube branch, an elbow, etc.

To reduce the pressure losses that occur in a piping system, the number of fittings should be kept to a minimum. Where changes in direction are required, preference should be given to bending straight sections of pipe rather than the use of a fitting, as long as this is a suitable option. Installation procedure guidelines are given on page 18.

Sizing of Gas Pipes

The sizing of gas pipes is important in order to ensure that each gas appliance that is part of an installation will have an inlet pressure that is sufficient to supply the appropriate gas flow rate to the burners. The minimum pressure at the inlet of any gas appliance shall be no less than that contained in *table 8*, as specified within NZS 5601.1:2010.

Table 8: Appliance Inlet Pressure Requirements

Gas Family	Minimum Gas Pressure Required at Appliance Inlets (kPa)
2nd (Natural Gas)	1.13
3rd (LPG)	2.75

In order to size the pipes within the system, the maximum possible gas flow rate in each pipe section must be determined i.e. assume a situation where all of the appliances in the system are operating at maximum demand unless prior information about system demand is given. It is also necessary to make provisions for any appliances which could be implemented in any future extensions of the piping system. When making changes to an existing installation, the maximum gas consumption rate of the existing appliances and any proposed new or replacement appliances must be taken into account. The pipe lengths and sizes as well as all of the fittings and bends in the existing system must be accounted for. As a general rule, the minimum diameter of mains gas supply lines should not be below 22mm in size.

The design of the piping system should be such that the maximum pressure drop between the gas meter outlet and the inlet of any appliance does not exceed 10% of the supply pressure. This limits the velocity of the gas in the pipework so as to minimise the possibility of excessive flow noise and long term erosion within the installation.

In order to size gas piping, the type of gas which will be used must be determined. Average gas properties of natural gas and LPG are shown in *table 9*. The supply pressure that is available and the allowable pressure drop are also required. Unless otherwise specified, the allowable pressure drop will be 10% of the supply pressure, so long as all appliance inlets are provided with a pressure no less than that shown in *table 8*.

Table 9: Properties of Natural Gas and LPG

	Natural Gas	LPG
Higher Heating Value (MJ/m3)	38	96
Relative Density (Air), RD	0.6	1.5
Viscosity (μPa.s)	12	8

A method for the rapid sizing of gas pipes by the use of gas flow tables is detailed below and an example given. The method used is known as the 'longest length' approach, and allowances for local pressure drops in each of the fittings can be made using *table 14*. For domestic systems with an average number of fittings, an additional 50% extension in length is appropriate in order to allow for local pressure drops. Additional considerations may be required for industrial and commercial applications where large amounts of fittings and larger diameter pipes are used. The tables are only applicable to certain situations which are described below. For uses that are not covered by the tables, recognised formulae or tables should be used.

Using the Pipe Sizing Tables

The tables give an indication of the amount (in MJ/h) of a particular type of gas that will flow through different pipe diameters, lengths and materials. Pipe sizing tables are available for the pressure drops shown in *table 10*. The process for using the gas pipe sizing tables is as follows:

Step 1:

Generate a diagram of the proposed gas installation. Determine the lengths of all of the required pipe sections and add these to the diagram. Starting from the point of supply, alphabetically label all of the junctions and end points. Establish the input rating of all of the proposed gas appliances in MJ/h (multiply kW ratings by 3.6 to convert to MJ/h). Refer to the appliance manufacturer's specifications for input ratings.

Step 2:

Create and fill in a table with the name (from the diagram labels), length and maximum gas flow for each section of the installation. Include a spare column to fill in the pipe diameter for each section once it has been found from the appropriate pipe sizing table. The maximum gas flow in a pipe section is found by simply summing the input ratings of all of the appliances that will be supplied by that particular pipe section.

Step 3:
Determine the total length of pipe that is required to supply the most distant gas appliance. Include allowances for fittings (see page 40). This is called the “main run”. The main run of the installation is the only length that is used within the sizing tables. This main run length determines what the minimum size is for all of the pipe sections.

Step 4:
Find the table *(from tables 11-13)* which is appropriate for the allowable pressure drop, type of gas, and type of material for the system. In this table find the column which contains the length of the main run. If the main run lies in between two stated lengths, then the column with the larger of the two values should be used. From this column, for each section of the pipe in the installation, find the row which contains gas flow (in MJ/h) that is equal to or greater than the required maximum demand of that pipe section. Read across the row that contains the adequate gas flow to find the appropriate pipe size for that section and record all of the results in the generated table.

Pipe Sizing Tables

Pipe sizing tables are available for the material types, gas types and pressure drops found in *table 10*.

Table 10: Summary of Available Pressure Drop Tables

Installation Type	Maximum Allowable Pressure Drop (kPa)
Natural Gas, VSH XPress Stainless Steel GAS	0.125, 0.2, 0.3, 0.4
LPG Gas, VSH XPress Stainless Steel GAS	Contact KE KELIT
Natural Gas, VSH XPress Copper GAS	0.125, 0.2, 0.3, 0.4
LPG Gas, VSH XPress Copper GAS	0.25, 10, 20

Important: Gas flow values in the tables marked with a * are not recommended because the corresponding gas velocities are deemed excessive i.e. they may be noisy and may cause premature erosion within piping systems. The values marked with a * should only be used if they are verified by an appropriately qualified person.

2nd Gas Family (Natural Gas) – VSH XPress Stainless Steel GAS Systems

Density: 0.79 kg/m3

Viscosity: 0.000015 Pa.s

Surface Roughness: 0.0015 mm

Table 11A: Natural Gas through STEELFIX Stainless Steel Pipe - Pressure Drop of 0.125 kPa (1.25 kPa supply)

	Main Run Length (m)								
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	135	89	70	59	52	46	42	39	36
18	240	159	125	105	92	82	75	69	65
22	423*	280	219	185	162	145	132	122	114
28	887*	586	460	387	339	304	277	256	239
35	1629*	1081	850	717	629	564	515	476	444
42	3003*	1966*	1534	1286	1122	1004	914	842	783
54	5894*	3913*	3079*	2598	2277	2044	1866	1724	1608
76.1	14473*	9699*	7674*	6499*	5713*	5142	4704	4355	4069
88.9	22442*	15061*	11927*	10107*	8889*	8004*	7325	6783	6339
108	39083*	26219*	20759*	17590*	15469*	13927*	12744*	11800*	11026
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	34	30	27	24	23	21	20	19	18
18	61	53	48	44	40	37	35	33	32
22	107	94	84	77	71	66	62	58	56
28	224	196	176	160	148	138	130	122	116
35	417	365	328	299	277	258	242	229	218
42	735	641	573	522	481	447	419	396	375
54	1511	1325	1189	1086	1003	936	879	831	789
76.1	3829	3366	3029	2771	2566	2397	2255	2135	2030
88.9	5966	5247	4724	4323	4004	3741	3521	3333	3170
108	10377	9126	8216	7518	6962	6505	6122	5795	5512

* See important note on page 30 regarding the use of these values

Table 11B: Natural Gas through STEELFIX Stainless Steel Pipe - Pressure Drop of 0.2 kPa (2.0 kPa supply)									
	Main Run Length (m)								
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	179	118	93	78	68	61	56	52	48
18	318*	210	165	139	122	109	100	92	86
22	560*	370	290	245	214	192	175	162	151
28	1174*	776*	609	513	449	403	367	339	316
35	2152*	1428*	1123	947	830	745	680	629	586
42	4003*	2620*	2045*	1715*	1496	1338	1218	1122	1044
54	7782*	5166*	4065*	3429*	3006	2699	2464	2277	2123
76.1	18986*	12723*	10067*	8526*	7495*	6746*	6171*	5713*	5338
88.9	29411*	19738*	15631*	13246*	11650*	10490*	9599*	8889*	8307*
108	51232*	34370*	27212*	23057*	20277*	18256*	16705*	15469*	14454*
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	45	40	35	32	30	28	26	25	23
18	80	70	63	58	53	50	47	44	42
22	142	124	111	101	94	87	82	77	74
28	297	260	233	212	196	183	172	162	154
35	551	483	433	395	365	341	320	303	287
42	979	854	764	695	641	596	559	528	500
54	1995	1749	1570	1433	1325	1235	1161	1097	1042
76.1	5023	4415	3974	3636	3366	3144	2959	2800	2663
88.9	7818	6876	6191	5666	5247	4903	4615	4368	4155
108	13603*	11963*	10770	9855	9126	8527	8025	7597	7225

* See important note on page 30 regarding the use of these values

Table 11C: Natural Gas through STEELFIX Stainless Steel Pipe with Pressure Drop of 0.3 kPa (3.0 kPa supply)									
	Main Run Length (m)								
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	228*	151	118	100	87	78	71	66	61
18	405*	268	210	177	155	139	127	117	109
22	713*	471*	370	312	273	245	223	206	192
28	1496*	989*	776*	653	572	513	468	432	403
35	2736*	1815*	1428*	1204*	1055	947	865	799	745
42	5129*	3357*	2620*	2197*	1917*	1715*	1561	1438	1338
54	9890*	6565*	5166*	4358*	3820*	3429*	3131*	2893	2699
76.1	23995*	16080*	12723*	10775*	9473*	8526*	7800*	7221*	6746*
88.9	37140*	24924*	19738*	16727*	14711*	13246*	12122*	11225*	10490*
108	64707*	43410*	34370*	29122*	25610*	23057*	21099*	19537*	18256*
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	58	50	45	41	38	35	33	31	30
18	102	90	80	73	68	63	59	56	53
22	180	158	142	129	119	111	104	99	94
28	378	331	297	271	250	233	219	207	196
35	700	614	551	503	465	433	407	385	365
42	1255	1095	979	891	821	764	717	676	641
54	2536	2222	1995	1821	1683	1570	1475	1394	1325
76.1	6348*	5580	5023	4595	4254	3974	3740	3539	3366
88.9	9873*	8683*	7818	7155	6626	6191	5827	5516	5247
108	17181*	15109*	13603*	12448*	11526*	10770	10136	9595	9126

* See important note on page 30 regarding the use of these values

Table 11D: Natural Gas through STEELFIX Stainless Steel Pipe with Pressure Drop of 0.4 kPa (4.0 kPa supply)									
	Main Run Length (m)								
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	271*	179	141	118	104	93	85	78	73
18	481*	318*	250	210	184	165	151	139	130
22	846*	560*	439*	370	324	290	265	245	228
28	1776*	1174*	922*	776*	679	609	556	513	478
35	3244*	2152*	1693*	1428*	1251*	1123	1025	947	884
42	6116*	4003*	3124*	2620*	2286*	2045*	1861*	1715*	1596
54	11723*	7782*	6124*	5166*	4528*	4065*	3711*	3429*	3199*
76.1	28332*	18986*	15022*	12723*	11185*	10067*	9209*	8526*	7965*
88.9	43825*	29411*	23291*	19738*	17360*	15631*	14304*	13246*	12378*
108	76366*	51232*	40563*	34370*	30225*	27212*	24901*	23057*	21545*
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	68	60	54	49	45	42	40	37	35
18	122	107	96	87	80	75	70	67	63
22	214	187	168	153	142	132	124	117	111
28	449	393	352	321	297	277	260	245	233
35	830	727	653	596	551	514	483	456	433
42	1496	1305	1168	1063	979	911	854	806	764
54	3006	2634	2365	2159	1995	1861	1749	1653	1570
76.1	7495*	6589*	5930*	5425	5023	4692	4415	4179	3974
88.9	11650*	10246*	9226*	8443*	7818	7306	6876	6509	6191
108	20277*	17832*	16054*	14690*	13603*	12711*	11963*	11324	10770

For details on pressure drop values for LPG with the VSH XPress Stainless Steel GAS range, please contact KE KELIT

* See important note on page 30 regarding the use of these values

2nd Gas Family (Natural Gas) – VSH XPress Copper GAS Systems

Table 12A: Natural Gas through COPPERFIX Copper Pipe with Pressure Drop of 0.125 kPa (Suitable for supply pressures of around 1.25 kPa)									
	Main Run Length (m)								
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	135	89	70	59	52	46	42	39	36
18	240	159	125	105	92	82	75	69	65
22	448*	296	232	196	171	154	140	129	120
28	827*	547	430	362	317	284	259	240	223
35	1629*	1081	850	717	629	564	515	476	444
42	3003*	1966*	1534	1286	1122	1004	914	842	783
54	5492*	3657*	2883*	2436	2137	1920	1754	1622	1514
66.7	7120*	4892*	3930*	3363	2981	2700	2484	2311	2169
76.1	9958*	6845*	5496*	4704	4169	3778	3476	3233	3033
88.9	15680*	10884*	8620*	7423	6550	5957	5466	5069	4754
108	-	-	-	-	-	-	-	-	-
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	34	30	27	24	23	21	20	19	18
18	61	53	48	44	40	37	35	33	32
22	113	99	89	81	75	70	65	62	59
28	210	184	165	150	139	129	122	115	109
35	417	365	328	299	277	258	242	229	218
42	735	641	573	522	481	447	419	396	375
54	1423	1249	1122	1025	948	884	831	786	747
66.7	2052	1818	1647	1515	1410	1324	1250	1187	1132
76.1	2864	2539	2300	2116	1969	1847	1744	1657	1581
88.9	4249	3768	3415	3139	2924	2739	2585	2461	2350
108	7525	6658	6026	5562	5150	4858	4598	4334	4122

* See important note on page 30 regarding the use of these values

Table 12B: Natural Gas through COPPERFIX Copper Pipe with Pressure Drop of 0.25 kPa (Suitable for supply pressures of around 1.5 - 2.5 kPa)									
Main Run Length (m)									
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	179	118	93	78	68	61	56	52	48
18	318	210	165	139	122	109	100	92	86
22	593	392	308	259	227	203	185	171	160
28	1094*	724	569	479	419	376	343	317	295
35	2152*	1428	1123	947	830	745	680	629	586
42	4003*	2620*	2045	1715	1496	1338	1218	1122	1044
54	7235*	4818*	3799*	3209	2815	2530	2311	2137	1994
66.7	10589*	7277*	5845*	5002	4433	4017	3695	3437	3225
76.1	14813*	10181*	8176*	6997	6201	5619	5169	4809	4513
88.9	23394*	16103*	12920*	11040	9807	8878	8174	7635	7151
108	-	-	-	-	-	-	-	-	-
Main Run Length (m)									
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	45	40	35	32	30	28	26	25	23
18	80	70	63	58	53	50	47	44	42
22	150	131	118	107	99	92	87	82	78
28	278	243	218	199	184	171	161	152	144
35	551	483	433	395	365	341	320	303	287
42	979	854	764	695	641	596	559	528	500
54	1875	1645	1478	1350	1249	1165	1095	1036	984
66.7	3052	2705	2451	2255	2098	1968	1859	1766	1685
76.1	4261	3777	3421	3147	2929	2748	2595	2466	2352
88.9	6322	5602	5074	4666	4342	4073	3849	3659	3486
108	11187	9923	8995	8285	7706	7235	6823	6465	6193

* See important note on page 30 regarding the use of these values

Table 12C: Natural Gas through COPPERFIX Copper Pipe with Pressure Drop of 0.75 kPa (Suitable for supply pressures of around 2.75 - 5 kPa)									
	Main Run Length (m)								
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	299	206	166	141	125	113	104	97	91
18	501	344	277	237	210	190	175	163	153
22	878	604	484	415	368	333	306	285	268
28	1737*	1194	958	821	727	659	606	564	529
35	3100*	2131	1711	1465	1298	1176	1082	1006	944
42	5259*	3615*	2903	2485	2202	1995	1835	1707	1602
54	10805*	7426*	5963*	5104	4523	4098	3771	3508	3291
66.7	19184*	13186*	10589*	9062	8032	7277	6695	6228	5845
76.1	26838*	18446*	14813*	12678	11236	10181	9366	8714	8176
88.9	42443*	29136*	23394*	20025	17753	16103	14818	13816	12920
108	-	-	-	-	-	-	-	-	-
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	-	-	-	-	-	-	-	-	-
18	143	126	114	105	98	92	87	82	79
22	256	227	205	189	176	165	156	148	141
28	498	442	400	368	342	321	304	288	275
35	892	790	716	659	613	575	543	516	492
42	1517	1345	1219	1121	1043	978	924	878	838
54	3105	2752	2493	2293	2134	2002	1891	1796	1714
66.7	5530	4901	4440	4086	3800	3566	3369	3199	3052
76.1	7720	6843	6199	5704	5306	4978	4702	4467	4261
88.9	11452	10151	9194	8457	7873	7383	6973	6629	6322
108	20270	17962	16292	14999	13926	13086	12364	11713	11187

* See important note on page 30 regarding the use of these values

Table 12D: Natural Gas through COPPERFIX Copper Pipe with Pressure Drop of 1.5 kPa (Suitable for supply pressures of around 5 - 10 kPa)									
Main Run Length (m)									
O.D. (mm)	2	4	5	8	10	12	14	16	18
15	436	299	241	206	183	166	152	141	133
18	730*	501	402	344	306	277	254	237	223
22	1278*	878	705	604	535	484	446	415	389
28	2527*	1737*	1395	1194	1058	958	882	821	770
35	4511*	3100*	2490	2131	1889	1711	1574	1465	1374
42	7653*	5259*	4224*	3615*	3204	2903	2670	2485	2331
54	15719*	10805*	8676*	7426*	6581*	5963	5486	5104	4789
66.7	27915*	19184*	15406*	13186*	11687*	10589	9741	9062	8504
76.1	39049*	26838*	21552*	18446*	16348*	14813*	13627	12678	11895
88.9	61654*	42443*	34053*	29136*	25787*	23394*	21573	20025	18787
108	-	-	-	-	-	-	-	-	-
Main Run Length (m)									
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	-	-	-	-	-	-	-	-	-
18	207	184	166	153	143	134	126	120	114
22	372	329	299	275	256	240	227	215	205
28	725	642	582	536	498	467	442	419	400
35	1298	1150	1042	959	892	837	790	751	716
42	2208	1957	1773	1631	1517	1424	1345	1277	1219
54	4517	4003	3627	3337	3105	2912	2752	2613	2493
66.7	8046	7132	6461	5944	5530	5188	4901	4655	4440
76.1	11233	9955	9020	8298	7720	7244	6843	6498	6199
88.9	16663	14761	13379	12309	11452	10745	10151	9639	9194
108	29501	26185	23696	21798	20270	19024	17962	17071	16292

* See important note on page 30 regarding the use of these values

3rd Gas Family (LPG Gas) – VSH XPress Copper GAS Systems

Table 13A: LPG Gas through COPPERFIX Copper Pipe with Pressure Drop of 0.25 kPa (Suitable for supply pressures of around 3.0 kPa)									
	Main Run Length (m)								
O.D. (mm)	2	4	6	8	10	12	14	16	18
15	313	215	173	147	131	119	109	101	95
18	514	353	284	242	215	195	179	167	157
22	893	613	493	421	374	339	311	290	272
28	1,771*	1,217	978	836	741	672	617	576	540
35	3,137*	2,155	1,731	1,481	1,312	1,191	1,093	1,020	956
42	5,213*	3,581	2,877	2,461	2,180	1,979	1,816	1,695	1,590
54	10,426*	7,162*	5,754	4,921	4,360	3,958	3,632	3,391	3,181
66.7	18,628*	12,794*	10,282	8,788	7,790	7,072	6,491	6,057	5,685
76.1	26,193*	17,987*	14,460*	12,353	10,953	9,943	9,129	8,514	7,995
88.9	39,087*	26,836*	21,580*	18,426*	16,343	14,836	13,625	12,701	11,933
108	69,379*	47,620*	38,314*	32,687*	29,005*	26,328	24,190	22,532	21,187
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	90	79	72	66	62	58	55	52	50
18	147	130	119	109	101	96	90	86	82
22	256	227	206	190	176	166	157	149	142
28	509	451	409	376	350	329	311	295	282
35	901	798	725	666	621	583	551	523	499
42	1,498	1,327	1,204	1,108	1,032	969	916	870	830
54	2,996	2,653	2,409	2,215	2,063	1,940	1,832	1,740	1,660
66.7	5,352	4,738	4,303	3,956	3,685	3,469	3,273	3,110	2,966
76.1	7,524	6,659	6,050	5,561	5,180	4,879	4,601	4,374	4,169
88.9	11,226	9,933	9,028	8,296	7,727	7,282	6,864	6,529	6,219
108	19,921	17,619	16,022	14,718	13,708	12,932	12,180	11,592	11,031

* See important note on page 30 regarding the use of these values

Table 13B: LPG Gas through COPPERFIX Copper Pipe with Pressure Drop of 10 kPa (Suitable for supply pressures of around 70 kPa)									
	Main Run Length (m)								
O.D. (mm)	2	4	6	8	10	12	14	16	18
15	2,988*	2,054	1,649	1,411	1,251	1,133	1,043	970	910
18	4,914*	3,378	2,712	2,321	2,058	1,864	1,715	1,596	1,497
22	8,542*	5,871	4,715	4,035	3,576	3,240	2,980	2,774	2,602
28	16,938*	11,641*	9,349	8,001	7,091	6,425	5,911	5,499	5,159
35	30,001*	20,619*	16,558*	14,172*	12,560	11,381	10,470	9,740	9,139
42	49,859*	34,268*	27,518*	23,552*	20,873*	18,914	17,400	16,187	15,188
54	99,721*	68,537*	55,038*	47,106*	41,749*	37,827*	34,801*	32,376*	30,376
66.7	178,168*	122,452*	98,337*	84,163*	74,594*	67,582*	62,176*	57,847*	54,269*
76.1	250,505*	172,167*	138,265*	118,335*	104,884*	95,017*	87,418*	81,336*	76,299*
88.9	373,789*	256,895*	206,316*	176,573*	156,507*	141,773*	130,437*	121,370*	113,844*
108	663,394*	455,924*	366,178*	313,382*	277,782*	251,598*	231,487*	215,421*	202,031*
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	860	762	691	635	591	554	524	497	475
18	1,414	1,253	1,136	1,044	972	912	861	818	780
22	2,458	2,178	1,974	1,816	1,689	1,585	1,497	1,422	1,357
28	4,874	4,319	3,914	3,600	3,350	3,143	2,969	2,819	2,690
35	8,632	7,651	6,932	6,377	5,933	5,567	5,258	4,994	4,765
42	14,346	12,715	11,521	10,599	9,860	9,252	8,738	8,300	7,918
54	28,694	25,431	23,042	21,198	19,721	18,504	17,479	16,600	15,837
66.7	51,268*	45,434	41,168	37,874	35,233	33,059	31,232	29,661	28,293
76.1	72,085*	63,879*	57,882	53,252	49,536	46,481	43,916	41,705	39,779
88.9	107,564*	95,312*	86,367*	79,460	73,913	69,354	65,535	62,232	59,353
108	190,912*	169,146*	153,281*	141,028*	131,174*	123,082*	116,328	110,453	105,332

* See important note on page 30 regarding the use of these values

Table 13C: LPG Gas through COPPERFIX Copper Pipe with Pressure Drop of 20 kPa (Suitable for supply pressures of around 140 kPa)									
	Main Run Length (m)								
O.D. (mm)	2	4	6	8	10	12	14	16	18
15	5,197*	3,572*	2,868	2,455	2,176	1,971	1,814	1,687	1,583
18	8,547*	5,874*	4,717	4,037	3,578	3,242	2,983	2,775	2,603
22	14,856*	10,211*	8,199	7,018	6,220	5,635	5,184	4,823	4,525
28	29,459*	20,247*	16,259*	13,916*	12,333	11,175	10,281	9,564	8,974
35	52,179*	35,862*	28,799*	24,648*	21,845*	19,794*	18,210	16,941	15,895
42	86,717*	59,601*	47,862*	40,964*	36,305*	32,895*	30,263*	28,154*	26,416
54	173,440*	119,204*	95,725*	81,929*	72,612*	65,791*	60,528*	56,309*	52,833*
66.7	309,880*	212,976*	171,026*	146,377*	129,730*	117,543*	108,141*	100,605*	94,394*
76.1	435,695*	299,446*	240,461*	205,805*	182,398*	165,262*	152,046*	141,451*	132,717*
88.9	650,120*	446,813*	358,795*	307,087*	272,159*	246,588*	226,872*	211,065*	198,031*
108	1,153,824*	792,991*	636,765*	545,001*	483,007*	437,622*	402,642*	374,592*	351,456*
	Main Run Length (m)								
O.D. (mm)	20	25	30	35	40	45	50	55	60
15	1,495	1,325	1,201	1,105	1,028	964	911	865	825
18	2,459	2,180	1,975	1,817	1,690	1,586	1,498	1,423	1,357
22	4,275	3,789	3,433	3,159	2,938	2,757	2,604	2,473	2,360
28	8,477	7,513	6,807	6,263	5,826	5,466	5,164	4,904	4,679
35	15,014	13,306	12,056	11,092	10,319	9,682	9,146	8,686	8,287
42	24,952	22,114	20,037	18,434	17,149	16,091	15,199	14,436	13,771
54	49,905*	44,231	40,076	36,869	34,300	32,183	30,399	28,872	27,544
66.7	89,162*	79,028*	71,604*	65,874	61,285	57,501	54,314	51,584	49,213
76.1	125,362*	111,118*	100,678*	92,622*	86,169*	80,847	76,368	72,528	69,195
88.9	187,055*	165,809*	150,230*	138,209*	128,581*	120,636*	113,954*	108,221*	103,252
108	331,976*	294,291*	266,637*	245,305*	228,215*	214,106*	202,249*	192,069*	183,258*

* See important note on page 30 regarding the use of these values

Fitting Allowances

The equivalent length method is a way of expressing a particular local resistance as an equivalent length of a straight piece of pipe with the same diameter which would have the same pressure drop. *Table 14* shows the equivalent length values for the various fitting types and sizes.

Table 14: Equivalent Length Values for Each Type of Fitting Depending on its Size

	Equivalent Length (m)						
							
O.D (mm)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
15	0.49	0.33	0.19	0.55	0.17	0.25	0.31
18	0.58	0.48	0.32	0.89	0.29	0.67	0.6
22	0.35	0.3	0.12	0.84	0.08	0.59	1.04
28	0.38	0.32	0.28	1.01	0.06	0.72	0.92
35	0.43	0.4	0.11	1.34	0.04	0.79	2.19
42	0.48	0.42	0.2	2.27	0.11	0.85	-
54	0.79	0.49	0.24	3.06	0.14	1.43	-
76.1	1.04	0.62	0.31	4.42	0.17	1.68	-
88.9	1.22	0.66	0.36	5.38	0.2	2.1	-
108	1.51	0.76	0.43	6.9	0.2	-	-

For most domestic installations a total additional length allowance of 50% is appropriate. In any other situation, *table 14* should be used to determine the effect that the fittings in the system have on the effective length of the main run.

Example Pipe Sizing Using the Tables

A gas pipe sizing example using the Pipe Sizing Tables on page 28 and Fitting Allowances on page 40 is given for the installation shown below. Here natural gas is supplied at 4 kPa through a VSH XPress Copper GAS system. The allowable pressure drop in the system is 0.4 kPa (10% of the supply pressure).

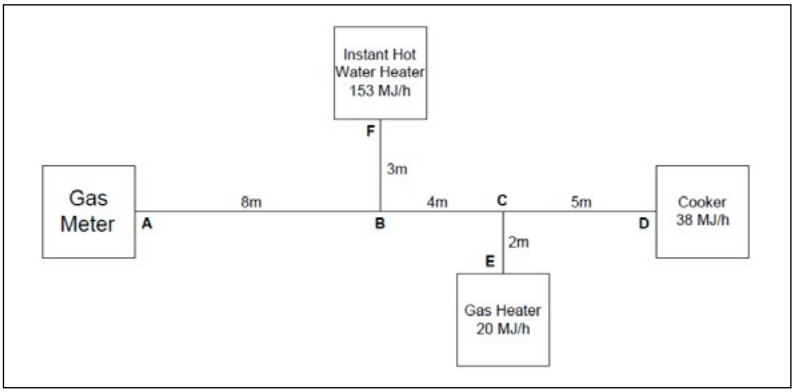


Fig. 15: Example VSH XPress Copper GAS System for Natural Gas

Figure 15 shows a diagram of a proposed installation. The required pipe lengths and gas flow ratings for each appliance are labelled. *Table 15* below is generated using this information.

Table 15: Table of System Information Used for the Rapid Sizing of Pipe Sections

Pipe Section	Length (m)	Gas Flow Demand (MJ/h)	Pipe O.D (mm)
A-B	8	211 (153 + 20 + 38)	TBD
B-C	4	58 (20 + 38)	TBD
C-D	5	38	TBD
C-E	2	20	TBD
B-F	3	153	TBD

The most distant fixture from the gas meter is the gas cooker (A-D) at a distance of 17 m. An additional length allowance of 50% is suitable for this small domestic installation, therefore the main run length is 17m x 1.5 = 25.5 m. This means the 30 m column of the table must be used for the main run.

*Table 14*D is the appropriate table to use for the conveyance of natural gas through copper piping with a maximum pressure drop of 0.4 kPa. For pipe section A-B, the maximum gas flow demand is 211 MJ/h. Looking down the 30 m column of *table 14*D, the 28mm pipe can supply a gas flow of 329 MJ/h in these conditions, and is the smallest size capable of carrying the required 211 MJ/h. 28mm pipe is therefore the minimum allowable size for pipe run A-B.

In a similar fashion, it is found that pipe run B-C must be at least 18mm (96 MJ/h) in size as this is the smallest pipe which can carry the required 58 MJ/h. The remaining pipe sections are sized using the same process, and all use the 30 m column as the effective main run length is 25.5 m.

Table 16 is the completed pipe sizing table with the size of all runs determined. It must be kept in mind that if the gas flow lies between two rows of the table, then the larger of the two determines the suitable size.

Table 16: Completed Table with Minimum Sizes for Each Pipe Section Determined

Pipe Section	Length (m)	Gas Flow Demand (MJ/h)	Pipe O.D (mm)
A-B	8	211	28
B-C	4	58	18
C-D	5	38	15
C-E	2	20	15
B-F	3	153	22

For more complex or high-pressure systems, more rigorous design methods are more appropriate.

Pressure Losses in Terms of Velocity and Flow Rate

Tables 17 - 19 give the relationships between flow rate, velocity and pressure loss in straight pipe sections depending upon the pipe material, pipe size and gas type.

Tables 17A-B on the following pages give the pressure loss [Δp] in the pipe for natural gas (2nd gas family) with density 0.79 kg/m3 and viscosity 0.000015 Pa.s as a function of the volumetric flow rate [V] and the flow velocity [v] for STEELFIX stainless steel 1.4401 pipes with a surface roughness of 0.0015 mm.

Table 17A: Pressure Loss in STEELFIX Stainless Steel Pipe, 2nd Gas Family, d15 - d35

d [mm]	15		18		22		28		35	
di [mm]	12.6		15.6		19		25		32	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.5	0.0077	0.3	0.0030	0.2	0.0012	0.1	0.0004	0.1	0.0001
0.50	1.0	0.0235	0.7	0.0090	0.5	0.0035	0.3	0.0010	0.2	0.0004
0.75	1.6	0.0457	1.0	0.0174	0.7	0.0068	0.4	0.0020	0.3	0.0007
1.00	2.1	0.0736	1.4	0.0280	0.9	0.0109	0.5	0.0032	0.3	0.0011
1.25	2.6	0.1068	1.7	0.0405	1.2	0.0157	0.7	0.0045	0.4	0.0016
1.50	3.1	0.1449	2.1	0.0549	1.4	0.0213	0.8	0.0061	0.5	0.0022
1.75	3.7	0.1879	2.4	0.0710	1.6	0.0275	0.9	0.0079	0.6	0.0028
2.00	4.2	0.2355	2.8	0.0889	1.8	0.0344	1.1	0.0099	0.7	0.0035
2.25	4.7	0.2875	3.1	0.1085	2.1	0.0419	1.2	0.0120	0.8	0.0042
2.50	5.2	0.3439	3.5	0.1296	2.3	0.0500	1.3	0.0143	0.9	0.0051
2.75	5.8	0.4046	3.8	0.1523	2.5	0.0588	1.5	0.0168	0.9	0.0059
3.00	6.3	0.4694	4.1	0.1766	2.8	0.0681	1.6	0.0195	1.0	0.0069
3.25	6.8	0.5383	4.5	0.2024	3.0	0.0779	1.8	0.0223	1.1	0.0078
3.50	7.3	0.6111	4.8	0.2297	3.2	0.0884	1.9	0.0252	1.2	0.0089
3.75	7.8	0.6880	5.2	0.2584	3.5	0.0994	2.0	0.0284	1.3	0.0100
4.00	8.4	0.7687	5.5	0.2885	3.7	0.1109	2.2	0.0316	1.4	0.0111
4.50	9.4	0.9415	6.2	0.3531	4.1	0.1356	2.4	0.0386	1.6	0.0135
5.00	10.5	1.1293	6.9	0.4231	4.6	0.1624	2.7	0.0462	1.7	0.0162
5.50			7.6	0.4986	5.1	0.1912	3.0	0.0543	1.9	0.0190
6.00			8.3	0.5793	5.5	0.2220	3.2	0.0630	2.1	0.0221
6.50			9.0	0.6653	6.0	0.2548	3.5	0.0723	2.2	0.0253

Table 17A: Pressure Loss in STEELFIX Stainless Steel Pipe, 2nd Gas Family, d15 - d35										
d [mm]	15		18		22		28		35	
di [mm]	12.6		15.6		19		25		32	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
7.00			9.7	0.7563	6.4	0.2895	3.8	0.0820	2.4	0.0287
7.50			10.4	0.9	6.9	0.3261	4.0	0.0924	2.6	0.0323
8.00					7.4	0.3646	4.3	0.1032	2.8	0.0360
8.50					7.8	0.4049	4.6	0.1145	2.9	0.0400
9.00					8.3	0.4470	4.9	0.1264	3.1	0.0441
9.50					8.7	0.4910	5.1	0.1387	3.3	0.0484
10.00					9.2	0.5367	5.4	0.1516	3.5	0.0528
10.50					9.7	0.5842	5.7	0.1649	3.6	0.0574
11.00					10.1	0.6334	5.9	0.1787	3.8	0.0622
11.50							6.2	0.1930	4.0	0.0672
12.00							6.5	0.2078	4.1	0.0723
12.50							6.7	0.2230	4.3	0.0776
13.00							7.0	0.2387	4.5	0.0830
13.50							7.3	0.2549	4.7	0.0886
14.00							7.6	0.2715	4.8	0.0943
14.50							7.8	0.2886	5.0	0.1003
15.00							8.1	0.3061	5.2	0.1063
16.00							8.6	0.3425	5.5	0.1189
17.00							9.2	0.3807	5.9	0.1321
18.00							9.7	0.4206	6.2	0.1459
19.00							10.3	0.4623	6.6	0.1603
20.00							10.8	0.5056	6.9	0.1752
21.00									7.3	0.1908
22.00									7.6	0.2069
23.00									7.9	0.2236
24.00									8.3	0.2409
25.00									8.6	0.2587
30.00									10.4	0.3560

Table 17B: Pressure Loss in STEELFIX Stainless Steel Pipe, 2nd Gas Family, d42 - d108											
d [mm]		42		54		76.1		88.9		108	
di [mm]		39		51		72.1		84.9		104	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0001	0.0	0.0000						
0.50	0.1	0.0002	0.1	0.0000						
0.75	0.2	0.0003	0.1	0.0001						
1.00	0.2	0.0005	0.1	0.0001						
1.25	0.3	0.0006	0.2	0.0002						
1.50	0.3	0.0009	0.2	0.0003						
1.75	0.4	0.0011	0.2	0.0003						
2.00	0.5	0.0014	0.3	0.0004						
2.25	0.5	0.0017	0.3	0.0005						
2.50	0.6	0.0020	0.3	0.0006						
2.75	0.6	0.0024	0.4	0.0007						
3.00	0.7	0.0027	0.4	0.0008						
3.25	0.8	0.0031	0.4	0.0009						
3.50	0.8	0.0035	0.5	0.0010						
3.75	0.9	0.0040	0.5	0.0011						
4.00	0.9	0.0044	0.5	0.0013						
4.50	1.0	0.0054	0.6	0.0015						
5.00	1.2	0.0064	0.7	0.0018						
5.50	1.3	0.0075	0.7	0.0021						
6.00	1.4	0.0087	0.8	0.0025						
6.50	1.5	0.0100	0.9	0.0028						
7.00	1.6	0.0113	1.0	0.0032						
7.50	1.7	0.0127	1.0	0.0036						
8.00	1.9	0.0142	1.1	0.0040						
8.50	2.0	0.0157	1.2	0.0045						
9.00	2.1	0.0173	1.2	0.0049						

Table 17B: Pressure Loss in STEELFIX Stainless Steel Pipe, 2nd Gas Family, d42 - d108										
d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
9.50	2.2	0.0190	1.3	0.0054						
10.00	2.3	0.0208	1.4	0.0059	0.7	0.0012	0.5	0.0005	0.3	0.0002
10.50	2.4	0.0226	1.4	0.0064	0.7	0.0013	0.5	0.0006	0.3	0.0002
11.00	2.6	0.0245	1.5	0.0069	0.7	0.0014	0.5	0.0006	0.4	0.0002
11.50	2.7	0.0264	1.6	0.0075	0.8	0.0015	0.6	0.0007	0.4	0.0003
12.00	2.8	0.0284	1.6	0.0080	0.8	0.0016	0.6	0.0007	0.4	0.0003
12.50	2.9	0.0305	1.7	0.0086	0.9	0.0017	0.6	0.0008	0.4	0.0003
13.00	3.0	0.0326	1.8	0.0092	0.9	0.0018	0.6	0.0008	0.4	0.0003
13.50	3.1	0.0348	1.8	0.0098	0.9	0.0019	0.7	0.0009	0.4	0.0003
14.00	3.3	0.0370	1.9	0.0104	1.0	0.0020	0.7	0.0009	0.5	0.0004
14.50	3.4	0.0393	2.0	0.0111	1.0	0.0022	0.7	0.0010	0.5	0.0004
15.00	3.5	0.0417	2.0	0.0117	1.0	0.0023	0.7	0.0011	0.5	0.0004
16.00	3.7	0.0466	2.2	0.0131	1.1	0.0026	0.8	0.0012	0.5	0.0005
17.00	4.0	0.0518	2.3	0.0146	1.2	0.0028	0.8	0.0013	0.6	0.0005
18.00	4.2	0.0572	2.4	0.0161	1.2	0.0031	0.9	0.0015	0.6	0.0006
19.00	4.4	0.0628	2.6	0.0176	1.3	0.0034	0.9	0.0016	0.6	0.0006
20.00	4.7	0.0686	2.7	0.0193	1.4	0.0038	1.0	0.0017	0.7	0.0007
21.00	4.9	0.0747	2.9	0.0210	1.4	0.0041	1.0	0.0019	0.7	0.0007
22.00	5.1	0.0810	3.0	0.0227	1.5	0.0044	1.1	0.0020	0.7	0.0008
23.00	5.3	0.0875	3.1	0.0245	1.6	0.0048	1.1	0.0022	0.8	0.0009
24.00	5.6	0.0942	3.3	0.0264	1.6	0.0051	1.2	0.0024	0.8	0.0009
25.00	5.8	0.1011	3.4	0.0284	1.7	0.0055	1.2	0.0026	0.8	0.0010
30.00	7.0	0.1390	4.1	0.0389	2.0	0.0076	1.5	0.0035	1.0	0.0013
35.00	8.1	0.1820	4.8	0.0509	2.4	0.0099	1.7	0.0046	1.1	0.0017
40.00	9.3	0.2301	5.4	0.0643	2.7	0.0124	2.0	0.0057	1.3	0.0022
45.00	10.5	0.2830	6.1	0.0790	3.1	0.0153	2.2	0.0070	1.5	0.0027

Table 17B: Pressure Loss in STEELFIX Stainless Steel Pipe, 2nd Gas Family, d42 - d108										
d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
50.00			6.8	0.0950	3.4	0.0183	2.5	0.0084	1.6	0.0032
55.00			7.5	0.1123	3.7	0.0217	2.7	0.0100	1.8	0.0038
60.00			8.2	0.1308	4.1	0.0252	2.9	0.0116	2.0	0.0044
65.00			8.8	0.1506	4.4	0.0290	3.2	0.0133	2.1	0.0051
70.00			9.5	0.1717	4.8	0.0330	3.4	0.0152	2.3	0.0058
75.00			10.2	0.1939	5.1	0.0373	3.7	0.0171	2.5	0.0065
80.00			10.9	0.2173	5.4	0.0417	3.9	0.0192	2.6	0.0073
85.00					5.8	0.0464	4.2	0.0213	2.8	0.0081
90.00					6.1	0.0514	4.4	0.0236	2.9	0.0090
95.00					6.5	0.0565	4.7	0.0259	3.1	0.0099
100.00					6.8	0.0618	4.9	0.0284	3.3	0.0108
105.00					7.1	0.0674	5.2	0.0309	3.4	0.0118
110.00					7.5	0.0732	5.4	0.0336	3.6	0.0128
115.00					7.8	0.0791	5.6	0.0363	3.8	0.0138
120.00					8.2	0.0853	5.9	0.0391	3.9	0.0149
125.00					8.5	0.0917	6.1	0.0421	4.1	0.0160
130.00					8.8	0.0983	6.4	0.0451	4.3	0.0171
135.00					9.2	0.1051	6.6	0.0482	4.4	0.0183
140.00					9.5	0.1121	6.9	0.0514	4.6	0.0195
145.00					9.9	0.1193	7.1	0.0547	4.7	0.0208
150.00					10.2	0.1266	7.4	0.0580	4.9	0.0221
160.00							7.9	0.0651	5.2	0.0247
170.00							8.3	0.0724	5.6	0.0275
180.00							8.8	0.0802	5.9	0.0304
190.00							9.3	0.0882	6.2	0.0335
200.00							9.8	0.0967	6.5	0.0367

Table 17B: Pressure Loss in STEELFIX Stainless Steel Pipe, 2nd Gas Family, d42 - d108											
d [mm]		42		54		76.1		88.9		108	
di [mm]		39		51		72.1		84.9		104	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
210.00							10.3	0.1054	6.9	0.0400
220.00									7.2	0.0434
230.00									7.5	0.0470
240.00									7.8	0.0507
250.00									8.2	0.0545
300.00									9.8	0.0753

For details on pressure loss values for LPG with the VSH XPress Stainless Steel GAS range, please contact KE KELIT.

Tables 18A-B below and on the following pages give the pressure loss [Δp] in the pipe for natural gas with density 0.79 kg/m3 and viscosity 0.000015 Pa.s as a function of the volumetric flow rate [V] and the flow velocity [v] for EN1057 copper pipes, with a surface roughness of 0.0015 mm.

Table 18A: Pressure Loss in COPPERFIX Copper Pipes, 2nd Gas Family, d12-d22								
d [mm]	12		15		18		22	
di [mm]	10		13		16		20	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	0.0258	0.5	0.0077	0.3	0.0030	0.2	0.0011
0.50	1.8	0.0794	1.0	0.0235	0.7	0.0090	0.4	0.0032
0.75	2.7	0.1551	1.6	0.0457	1.0	0.0174	0.7	0.0062
1.00	3.5	0.2506	2.1	0.0736	1.4	0.0280	0.9	0.0099
1.25	4.4	0.3646	2.6	0.1068	1.7	0.0405	1.1	0.0143
1.50	5.3	0.4960	3.1	0.1449	2.1	0.0549	1.3	0.0194
1.75	6.2	0.6442	3.7	0.1879	2.4	0.0710	1.5	0.0250
2.00	7.1	0.8085	4.2	0.2355	2.8	0.0889	1.8	0.0313

Table 18A: Pressure Loss in COPPERFIX Copper Pipes, 2nd Gas Family, d12-d22								
d [mm]	12		15		18		22	
di [mm]	10		13		16		20	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
2.25	8.0	0.9885	4.7	0.2875	3.1	0.1085	2.0	0.0381
2.50	8.8	1.1837	5.2	0.3439	3.5	0.1296	2.2	0.0455
2.75	9.7	1.3939	5.8	0.4046	3.8	0.1523	2.4	0.0534
3.00	10.6	1.6186	6.3	0.4694	4.1	0.1766	2.7	0.0619
3.25			6.8	0.5383	4.5	0.2024	2.9	0.0709
3.50			7.3	0.6111	4.8	0.2297	3.1	0.0804
3.75			7.8	0.6880	5.2	0.2584	3.3	0.0904
4.00			8.4	0.7687	5.5	0.2885	3.5	0.1009
4.50			9.4	0.9415	6.2	0.3531	4.0	0.1233
5.00			10.5	1.1293	6.9	0.4231	4.4	0.1477
5.50					7.6	0.4986	4.9	0.1738
6.00					8.3	0.5793	5.3	0.2018
6.50					9.0	0.6653	5.7	0.2316
7.00					9.7	0.7563	6.2	0.2632
7.50					10.4	0.9	6.6	0.2964
8.00							7.1	0.3314
8.50							7.5	0.3680
9.00							8.0	0.4063
9.50							8.4	0.4462
10.00							8.8	0.4877
10.50							9.3	0.5308
11.00							9.7	0.5755

Table 18B: Pressure Loss in COPPERFIX Copper Pipes, 2nd Gas Family, d28-d54								
d [mm]	28		35		42		54	
di [mm]	25		32		39		50	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0004	0.1	0.0001	0.1	0.0001	0.0	0.0000
0.50	0.3	0.0012	0.2	0.0004	0.1	0.0002	0.1	0.0000
0.75	0.4	0.0022	0.3	0.0007	0.2	0.0003	0.1	0.0001
1.00	0.6	0.0035	0.3	0.0011	0.2	0.0005	0.1	0.0001
1.25	0.7	0.0051	0.4	0.0016	0.3	0.0006	0.2	0.0002
1.50	0.8	0.0069	0.5	0.0022	0.3	0.0009	0.2	0.0003
1.75	1.0	0.0088	0.6	0.0028	0.4	0.0011	0.2	0.0004
2.00	1.1	0.0110	0.7	0.0035	0.5	0.0014	0.3	0.0004
2.25	1.3	0.0134	0.8	0.0042	0.5	0.0017	0.3	0.0005
2.50	1.4	0.0160	0.9	0.0051	0.6	0.0020	0.4	0.0006
2.75	1.6	0.0188	0.9	0.0059	0.6	0.0024	0.4	0.0007
3.00	1.7	0.0217	1.0	0.0069	0.7	0.0027	0.4	0.0009
3.25	1.8	0.0249	1.1	0.0078	0.8	0.0031	0.5	0.0010
3.50	2.0	0.0282	1.2	0.0089	0.8	0.0035	0.5	0.0011
3.75	2.1	0.0317	1.3	0.0100	0.9	0.0040	0.5	0.0012
4.00	2.3	0.0353	1.4	0.0111	0.9	0.0044	0.6	0.0014
4.50	2.5	0.0432	1.6	0.0135	1.0	0.0054	0.6	0.0017
5.00	2.8	0.0516	1.7	0.0162	1.2	0.0064	0.7	0.0020
5.50	3.1	0.0607	1.9	0.0190	1.3	0.0075	0.8	0.0023
6.00	3.4	0.0705	2.1	0.0221	1.4	0.0087	0.8	0.0027
6.50	3.7	0.0808	2.2	0.0253	1.5	0.0100	0.9	0.0031
7.00	4.0	0.0918	2.4	0.0287	1.6	0.0113	1.0	0.0035
7.50	4.2	0.1033	2.6	0.0323	1.7	0.0127	1.1	0.0040
8.00	4.5	0.1154	2.8	0.0360	1.9	0.0142	1.1	0.0044
8.50	4.8	0.1281	2.9	0.0400	2.0	0.0157	1.2	0.0049
9.00	5.1	0.1414	3.1	0.0441	2.1	0.0173	1.3	0.0054

Table 18B: Pressure Loss in COPPERFIX Copper Pipes, 2nd Gas Family, d28-d54								
d [mm]	28		35		42		54	
di [mm]	25		32		39		50	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
9.50	5.4	0.1552	3.3	0.0484	2.2	0.0190	1.3	0.0059
10.00	5.7	0.1696	3.5	0.0528	2.3	0.0208	1.4	0.0064
10.50	5.9	0.1845	3.6	0.0574	2.4	0.0226	1.5	0.0070
11.00	6.2	0.1999	3.8	0.0622	2.6	0.0245	1.6	0.0076
11.50	6.5	0.2159	4.0	0.0672	2.7	0.0264	1.6	0.0082
12.00	6.8	0.2325	4.1	0.0723	2.8	0.0284	1.7	0.0088
12.50	7.1	0.2495	4.3	0.0776	2.9	0.0305	1.8	0.0094
13.00	7.4	0.2671	4.5	0.0830	3.0	0.0326	1.8	0.0101
13.50	7.6	0.2852	4.7	0.0886	3.1	0.0348	1.9	0.0108
14.00	7.9	0.3038	4.8	0.0943	3.3	0.0370	2.0	0.0115
14.50	8.2	0.3229	5.0	0.1003	3.4	0.0393	2.1	0.0122
15.00	8.5	0.3425	5.2	0.1063	3.5	0.0417	2.1	0.0129
16.00	9.1	0.3833	5.5	0.1189	3.7	0.0466	2.3	0.0144
17.00	9.6	0.4260	5.9	0.1321	4.0	0.0518	2.4	0.0160
18.00	10.2	0.4707	6.2	0.1459	4.2	0.0572	2.5	0.0177
19.00	10.8	0.5174	6.6	0.1603	4.4	0.0628	2.7	0.0194
20.00	11.3	0.5660	6.9	0.1752	4.7	0.0686	2.8	0.0212
21.00			7.3	0.1908	4.9	0.0747	3.0	0.0230
22.00			7.6	0.2069	5.1	0.0810	3.1	0.0250
23.00			7.9	0.2236	5.3	0.0875	3.3	0.0270
24.00			8.3	0.2409	5.6	0.0942	3.4	0.0290
25.00			8.6	0.2587	5.8	0.1011	3.5	0.0311
30.00			10.4	0.3560	7.0	0.1390	4.2	0.0427
35.00					8.1	0.1820	5.0	0.0559
40.00					9.3	0.2301	5.7	0.0706
45.00					10.5	0.2830	6.4	0.0868

Table 18B: Pressure Loss in COPPERFIX Copper Pipes, 2nd Gas Family, d28-d54								
d [mm]	28		35		42		54	
di [mm]	25		32		39		50	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
50.00							7.1	0.1044
55.00							7.8	0.1234
60.00							8.5	0.1438
65.00							9.2	0.1655
70.00							9.9	0.1887
75.00							10.6	0.2131
80.00							11.3	0.2388

For details on pressure loss values for 66.7mm to 108mm in the VSH XPress Copper GAS range, please contact KE KELIT

Tables 19A-B below and on the following page give the pressure loss [Δp] in the pipe for LPG with density 540 kg/m3 and viscosity 0.0002 Pa.s as a function of the volumetric flow rate [V] and the flow velocity [v] for COPPERFIX copper pipes, with a surface roughness of 0.0015 mm.

Table 19A: Pressure Loss in COPPERFIX Copper Pipes, 3rd Gas Family, d12-d22								
d [mm]	12		15		18		22	
di [mm]	10		13		16		20	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	5.31	0.5	1.52	0.3	0.56	0.2	0.20
0.50	1.8	18.26	1.0	5.17	0.7	1.91	0.4	0.66
0.75	2.7	37.90	1.6	10.68	1.0	3.94	0.7	1.35
1.00	3.5	63.89	2.1	17.93	1.4	6.59	0.9	2.26
1.25	4.4	96.00	2.6	26.84	1.7	9.84	1.1	3.36
1.50	5.3	134.12	3.1	37.38	2.1	13.68	1.3	4.66
1.75	6.2	178.13	3.7	49.51	2.4	18.08	1.5	6.15

Table 19A: Pressure Loss in COPPERFIX Copper Pipes, 3rd Gas Family, d12-d22								
d [mm]	12		15		18		22	
di [mm]	10		13		16		20	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
2.00	7.1	227.98	4.2	63.20	2.8	23.04	1.8	7.83
2.25	8.0	283.60	4.7	78.43	3.1	28.55	2.0	9.69
2.50	8.8	344.96	5.2	95.19	3.5	34.60	2.2	11.73
2.75	9.7	412.02	5.8	113.46	3.8	41.19	2.4	13.94
3.00	10.6	484.74	6.3	133.23	4.1	48.31	2.7	16.33
3.25			6.8	154.49	4.5	55.95	2.9	18.90
3.50			7.3	177.24	4.8	64.11	3.1	21.63
3.75			7.8	201.46	5.2	72.79	3.3	24.54
4.00			8.4	227.15	5.5	81.99	3.5	27.61
4.50			9.4	282.91	6.2	101.92	4.0	34.26
5.00			10.5	344.50	6.9	123.88	4.4	41.58
5.50					7.6	147.86	4.9	49.55
6.00					8.3	173.84	5.3	58.17
6.50					9.0	201.82	5.7	67.44
7.00					9.7	231.79	6.2	77.36
7.50					10.4	263.73	6.6	87.91
8.00							7.1	99.10
8.50							7.5	110.92
9.00							8.0	123.37
9.50							8.4	136.45
10.00							8.8	150.16
10.50							9.3	164.49
11.00							9.7	179.45

Table 19B: Pressure Loss in COPPERFIX Copper Pipes, 3rd Gas Family, d28-d54								
d [mm]	28		35		42		54	
di [mm]	25		32		39		50	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.07	0.1	0.02	0.1	0.01	0.0	0.00
0.50	0.3	0.23	0.2	0.07	0.1	0.03	0.1	0.01
0.75	0.4	0.46	0.3	0.14	0.2	0.06	0.1	0.02
1.00	0.6	0.77	0.3	0.24	0.2	0.09	0.1	0.03
1.25	0.7	1.15	0.4	0.35	0.3	0.14	0.2	0.04
1.50	0.8	1.60	0.5	0.49	0.3	0.19	0.2	0.06
1.75	1.0	2.10	0.6	0.64	0.4	0.25	0.2	0.08
2.00	1.1	2.67	0.7	0.82	0.5	0.32	0.3	0.10
2.25	1.3	3.30	0.8	1.01	0.5	0.39	0.3	0.12
2.50	1.4	3.99	0.9	1.22	0.6	0.47	0.4	0.14
2.75	1.6	4.74	0.9	1.44	0.6	0.56	0.4	0.17
3.00	1.7	5.55	1.0	1.69	0.7	0.65	0.4	0.20
3.25	1.8	6.42	1.1	1.95	0.8	0.75	0.5	0.23
3.50	2.0	7.34	1.2	2.23	0.8	0.86	0.5	0.26
3.75	2.1	8.32	1.3	2.53	0.9	0.97	0.5	0.30
4.00	2.3	9.35	1.4	2.84	0.9	1.09	0.6	0.33
4.50	2.5	11.59	1.6	3.51	1.0	1.35	0.6	0.41
5.00	2.8	14.04	1.7	4.25	1.2	1.64	0.7	0.49
5.50	3.1	16.71	1.9	5.05	1.3	1.94	0.8	0.59
6.00	3.4	19.60	2.1	5.92	1.4	2.28	0.8	0.69
6.50	3.7	22.70	2.2	6.85	1.5	2.63	0.9	0.79
7.00	4.0	26.00	2.4	7.84	1.6	3.01	1.0	0.91
7.50	4.2	29.52	2.6	8.89	1.7	3.41	1.1	1.03
8.00	4.5	33.24	2.8	10.00	1.9	3.83	1.1	1.16
8.50	4.8	37.17	2.9	11.17	2.0	4.28	1.2	1.29
9.00	5.1	41.31	3.1	12.40	2.1	4.75	1.3	1.43

Table 19B: Pressure Loss in COPPERFIX Copper Pipes, 3rd Gas Family, d28-d54								
d [mm]	28		35		42		54	
di [mm]	25		32		39		50	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
9.50	5.4	45.65	3.3	13.70	2.2	5.24	1.3	1.58
10.00	5.7	50.19	3.5	15.05	2.3	5.76	1.4	1.73
10.50	5.9	54.94	3.6	16.46	2.4	6.29	1.5	1.89
11.00	6.2	59.88	3.8	17.93	2.6	6.85	1.6	2.06
11.50	6.5	65.03	4.0	19.45	2.7	7.43	1.6	2.23
12.00	6.8	70.38	4.1	21.04	2.8	8.04	1.7	2.41
12.50	7.1	75.93	4.3	22.68	2.9	8.66	1.8	2.60
13.00	7.4	81.68	4.5	24.39	3.0	9.31	1.8	2.79
13.50	7.6	87.62	4.7	26.14	3.1	9.97	1.9	2.99
14.00	7.9	93.77	4.8	27.96	3.3	10.66	2.0	3.19
14.50	8.2	100.11	5.0	29.83	3.4	11.37	2.1	3.40
15.00	8.5	106.65	5.2	31.76	3.5	12.10	2.1	3.62
16.00	9.1	120.32	5.5	35.79	3.7	13.63	2.3	4.07
17.00	9.6	134.78	5.9	40.05	4.0	15.23	2.4	4.55
18.00	10.2	150.02	6.2	44.53	4.2	16.93	2.5	5.05
19.00	10.8	166.04	6.6	49.24	4.4	18.70	2.7	5.58
20.00	11.3	182.84	6.9	54.17	4.7	20.56	2.8	6.13
21.00			7.3	59.32	4.9	22.50	3.0	6.70
22.00			7.6	64.69	5.1	24.53	3.1	7.30
23.00			7.9	70.28	5.3	26.63	3.3	7.92
24.00			8.3	76.10	5.6	28.82	3.4	8.57
25.00			8.6	82.13	5.8	31.08	3.5	9.24
30.00			10.4	115.58	7.0	43.63	4.2	12.93
35.00					8.1	58.17	5.0	17.20
40.00					9.3	74.69	5.7	22.03
45.00					10.5	93.17	6.4	27.43

Table 19B: Pressure Loss in COPPERFIX Copper Pipes, 3rd Gas Family, d28-d54								
d [mm]	28		35		42		54	
di [mm]	25		32		39		50	
V [m3/h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
50.00							7.1	33.38
55.00							7.8	39.88
60.00							8.5	46.93
65.00							9.2	54.53
70.00							9.9	62.67
75.00							10.6	71.36
80.00							11.3	80.58

For details on pressure loss values for 66.7mm to 108mm in the VSH XPress Copper GAS range, please contact KE KELIT

The pressure loss tables for other situations (other applications etc.) are available from KE KELIT NZ on request or from the VSH website (vsh.eu).

Built In

Recommendations

For aesthetical and practical reasons, it is rare that pipe is installed uncovered in modern installations other than in technical spaces, such as cellars and garages. Several precautionary measures are necessary if pipe is to be built in/recessed in walls or floors. The following systems can be built in/recessed:

- VSH XPress Stainless Steel GAS with corrosion protection*
- VSH XPress Copper GAS with corrosion-protection (e.g. coating/protective sleeve).

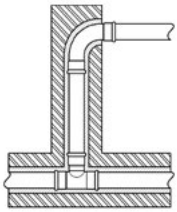


Fig. 16

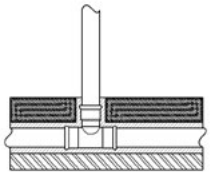


Fig. 17

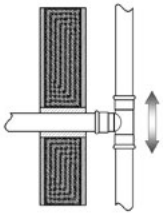


Fig. 18

Figure 16 shows a cross-section of pipe installed inside a wall. The pipe and fittings have to be wrapped by an elastic and pliable coating that separates the installation completely from the building so that there is no direct contact. Insulation materials satisfying the requirements of DIN1988 are a good solution for this purpose.

Similarly, for pipes installed inside floors, even sprung floors, the horizontal stretches must be isolated by a protective sleeve, such as that shown in *Figure 17*.

An adequate elastic sleeve must be used where the pipe exits the floor so that the pipe does not come into contact with the cement, should the pipe expand *(see Figure 17)*.

Important: VSH XPress Copper GAS systems are not for installation below ground, unless within protective ducting and within a building

Figure 18 shows a classical situation of branching from the outside riser to a point in the building. In such a case, you must make sure that the tee-piece is not subjected to any stresses as a result of a change in the direction of the axis of the fitting. In this context, the mounting brackets, as fixed mounting points and clips, are therefore very important. Pipes and fittings, in all installations, should as a general rule always be enclosed in a soft material in order to allow for expansion. We must emphasise once again that great care must be taken when selecting insulation materials for stainless steel pipes and materials for surrounding such pipes so as to ensure that they do not ever allow any chloride ions to come into contact with the pipes. In the case of copper, harmful substances from the environment, such as ammonia or nitrates, must be prevented from penetrating the insulating material.

* VSH XPress Stainless Steel GAS fittings and STEELFIX stainless steel 1.4401 pipes, although they are corrosion resistant, should not be laid unprotected in concrete/cement as the humid/wet concrete could cause chemical components to be concentrated around the piping system and affect it. In building materials that contain chloride, stainless steel tubes must be protected accordingly.

Mounting Pipe

Table 20: Maximum Distances Between Mounting Brackets in Accordance with EN 806, Part 4		
Ø Pipe Diameter [mm]	Max. Distance Stainless Steel [m]	Max. Distance Copper [m]
15 x 1.0	1.25	1.20
18 x 1.0	1.50	1.50
22 x 1.2	2.00	1.80
28 x 1.2	2.25	1.80
35 x 1.5	2.75	2.40
42 x 1.5	3.00	2.40
54 x 1.5	3.50	2.70
64 x 1.5	4.25	3.00
66.7 x 1.5	4.25	3.00
76.1 x 2.0	4.25	3.00
88.9 x 2.0	4.75	3.00
108 x 2.0	5.00	3.00

Observance of the above distances between attachment points is not sufficient in itself. These mounting distances are for guidance only. Please observe local standards and requirements, as these always take precedence. Heat expansion also needs to be appropriately compensated for in horizontal stretches and, therefore, the distances above may need to be adjusted.

When securing the pipe, the following must be kept in mind: the load-bearing capacity of the mounting brackets must correspond to the weight of the pipelines (including their contents) and also withstand expansion and torsion forces. Mounting brackets, such as fixed mounting points and clips, must therefore be correctly placed and assembled. Attachment points may only be fitted onto straight pipe sections. Mounting directly onto fittings is not allowed.

Pressure Test

As soon as a piping system has been installed, it must be checked for leaks before being covered up and concealed. With gas installations, the pressure test can be carried out with air, the gas for which the system is designed, or an inert gas. Oxygen cannot be used as a substitute for air. The test medium and the results of the pressure test must be documented in a so-called pressure test report. If the internal pipework volume exceeds 30L, a specific written testing procedure is required in the certified design for the gas installation (or part installation). For safety reasons, the maximum test pressure with air or inert gases is set at 3 bar.

Important: Aalberts integrated piping systems and KE KELIT NZ stress that pressure testing of the piping system must be carried out in all cases. Before being covered up, insulated, painted or walled in, a piping system must first undergo pressure testing in order to be certain that there are no leaks. Pressure tests must always be performed in accordance with local regulations.

Pressure Test for Gas Systems Important:

The pressure test for natural gas and liquid gas systems must be performed in accordance with local regulations. In New Zealand this involves gas tightness tests in accordance with Appendix E of AS/NZS 5601.1:2013. This ensures that the piping system will withstand a foreseeable pressure. The procedure for testing newly installed or altered pipework includes multiple pressure tests at various stages of the installation. In general, the tests include pressurising the pipework to 1.5 times the operating pressure (or 7 kPa, whichever is greater), allowing the temperature to stabilise for 2 minutes, and then monitoring the subsequent pressure loss over a period of 5 minutes. The pipework can only be considered gas-tight if there is no pressure loss recorded over the 5 minute test period. Additional measures may be required to confirm that the overall system is gas-tight and safe. Further details of the pressure testing process are contained in the VSH XPress GAS distributed by KE KELIT NZ Training Manual, and in Appendix E of AS/NZS 5601.1:2013.

Purging

Purging of all air (or inert gas) must be performed once the work is completed, prior to commissioning or the use of any connected gas appliances. This must be carried out to avoid the possibility of an explosive air and gas mixture forming in piping, appliances, or confined spaces. Further details of the purging process are contained in the VSH XPress GAS distributed by KE KELIT NZ Training Manual.

Important: Do not commence any purging operation until a purging area is defined, made safe and cleared of all potential ignition sources. **Local regulations must always be observed.**

Corrosion

There are different kinds of corrosion: chemical corrosion, electro-chemical corrosion, internal and external local corrosion, stray current corrosion, etc. All these kinds of corrosion have very particular chemical or mechanical causes. The following paragraphs provide some simple hints on how to avoid such problems.

Stray Currents

Corrosion by stray currents rarely occurs in practice and is immediately recognisable as it starts on the outside of the pipe with a cone-shaped crater to the inside. Stray current corrosion requires a direct current that turns the metal into an anode. The current, which in practice (despite insulation measures) penetrates into the earth and from there goes into other neighbouring metal structures (such as a gas supply installation) and runs through

a particular stretch of the system before it returns to earth again. In order to penetrate into the piping system, the earth current must have an entry point at a spot where the normal protective cover of the pipe or connection is damaged or missing.

For this reason, metal pipelines must be earthed. Direct current installations are generally not used in domestic households and no real problems occur with alternating current. Research over decades has shown that problems by stray currents only occur sporadically and do not depend on the type of metal.

Prevention of Corrosion

Instructions will be found in the following paragraphs on how to prevent corrosion problems in the most usual places.

External Corrosion

General: There are few situations in which outer corrosion occurs in buildings. It is, however, possible in many cases that installations are exposed for a long period to undesired penetration of rain, humidity or dampness and this can lead to problems. Responsibility for taking relevant measures rests, however, with the user and the installer. Only suitable corrosion protection can offer permanent certainty against corrosion. One way of doing so is to use “closed cell” insulation, which must be applied in a guaranteed waterproof condition. Suitable primers - or metallic paints may offer minimal corrosion protection. It is advisable to always use corrosion protection on the piping in situations where corrosion is likely to occur (damp rooms, crawl spaces, etc.).

Stainless Steel: Outer corrosion can occur if STEELFIX stainless steel 1.4401 piping comes into contact with chlorine gas, salt water or brine or (oxygen-saturated) water with a high chlorine content. If there is the danger of building materials coming into contact over a long period with highly chlorinated water, suitable corrosion protection must be used.

Copper: Copper’s high resistance to corrosion often renders corrosion-protection measures superfluous. However, copper tubing must sometimes also be protected from the impact of outer corrosion, such as sulphites, nitrites and ammonia.

Important: VSH XPress Copper GAS systems are not for installation below ground, unless within a building and within protective ducting. Gas pipes must be protected against corrosion in accordance with local regulations.

Impact of Application & Processing

General: Corrosion may occur due to incorrectly designed installations and faulty applications. The following points must be observed:

Stainless Steel:

Cutting Stainless Steel: Cutting through stainless steel pipe with a grinder is not allowed due to the amount of heat developed.

Bending Stainless Steel Pipes: Stainless steel pipes may not be bent warm. The heating of the stainless steel pipe alters the structure of the material (sensitisation) and inter-crystalline corrosion can take place.

Connections: Welding of stainless steel pipe may cause pitting or ring corrosion. In the case of TIG welding of stainless steel, discolouration occurs at the welding joints, which may lead to corrosion on contact with salt water. This discolouration, mainly on the inside of the pipe, can only be removed by staining, which is not practical with piping that has already been installed.

Effect of Insulation

General: “Closed cell insulation” (sealed watertight) offers effective protection against corrosion. The installation instructions of the supplier of the insulating material must always be followed carefully. Remove dust, dirt, oil and water from the piping prior to insulating.

The different sections of the insulation material must be carefully joined, taking care that no moisture or water can enter the material.

Also take care that the water barrier of the insulation material is not damaged during installation as moisture could otherwise penetrate under the insulation material

Insulating Stainless Steel: Insulating materials that release chloride ions in water or which could cause a local increase in chloride ions are not permitted. The weight ratio of water-solution chloride ions in the thermal insulation of the pipe may not exceed 0.05% (AS quality).

Insulating Copper: Insulating materials for copper must be nitrate-free i.e. they may not contain more than 0.02% nitrate

International Approvals

DVGW CERT

DVGW

CERT

DVGW-Baumusterprüfzertifikat

DVGW type examination certificate

DG-8531BP0467

Registriernummer
registration number

Anwendungsbereich ***field of application***	Produkte der Gasversorgung *products of gas supply*
Zertifikatinhaber ***owner of certificate***	Aalberts integrated piping systems B.V. Oude Amersfoortseweg 99, NL-1212 AA Hilversum
Vertreiber ***distributor***	Aalberts integrated piping systems B.V. Oude Amersfoortseweg 99, NL-1212 AA Hilversum
Produktart ***product category***	Installationssysteme und Systemverbinder: Rohrverbinder für Gasinstallationssysteme (8531)
Produktbezeichnung ***product description***	Edelstahlpressverbinder für Edelstahlrohre nach DVGW GW 541 für die Gasinstallation
Modell ***model***	VSH XPress Edelstahl Gas
Prüfberichte ***test reports***	Baumusterprüfung: 20191206 vom 12.06.2019 (TTR)
Prüfgrundlagen ***test basis***	DVGW G 5614 (01.12.2013)
Ablaufdatum / AZ ***date of expiry / file no.***	26.07.2024 / 20-0577-GNU

30.09.2020 Rie A-1/2

Datum, Bearbeiter, Blatt, Leiter der Zertifizierungsstelle
date, issued by, sheet, head of certification body

DVGW CERT GmbH ist von der DAkkS nach DIN EN ISO/IEC 17065:2013 akkreditierte Stelle für die Zertifizierung von Produkten der Energie- und Wasserversorgung.

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DAkkS
Deutsche Akkreditierungsstelle
D-ZE-16028-01-05

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DVGW type examination certificate

DVGW-Baumusterprüfzertifikat

DG-4550BL0160
Registration Number
Registriernummer

Field of Application ***Anwendungsbereich***	products of gas supply *Produkte der Gasversorgung*
Owner of Certificate ***Zertifikatinhaber***	Aalberts integrated piping systems B.V. Oude Amersfoortseweg 99, NL-1212 AA Hilversum
Distributor ***Vertreiber***	Aalberts integrated piping systems B.V. Oude Amersfoortseweg 99, NL-1212 AA Hilversum
Product Category ***Produktart***	installation systems and system joints: compression joint for metallic gas pipes (8531)
Product Description ***Produktbezeichnung***	Compression joint for metallic gas pipes
Model ***Modell***	VSH XPress Copper Gas
Test Reports ***Prüfberichte***	laboratory control test: 120001607-17 from 06.06.2017 (MPM) laboratory control test: 120001141-17 from 31.05.2017 (MPM)
Test Basis ***Prüfgrundlagen***	DVGW G 5614 (01.12.2013)

Date of Expiry / File No. 05.05.2023 / 20-0579-GNU
Ablaufdatum / Aktenzeichen

30.09.2020 Fk A-1/2
Date, Issued by, Sheet, Head of Certification Body
Datum, Bearbeiter, Blatt, Leiter der Zertifizierungsstelle

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für Wissenschaft, Forschung und Wirtschaft

ÖVGW GEPRÜFT

ÖVGW-Zertifikat

über die Verleihung des Rechtes
zur Führung der ÖVGW-Qualitätsmarke Gas

Registrierungsnummer

G 2.822

Geltungsdauer

bis Ende März 2020

Inhaber

VSH Fittings. B.V.
Oude Amersfoortseweg 99
1212 AA Hilversum
NIEDERLANDE

◆ Vertrieb in Österreich

Seppelfricke-Simplex Armaturen Austria GmbH
Arlbergstraße 139
6900 Bregenz

Hersteller

VSH Fittings. B.V. / NL

Prüfungsart

Verlängerungsprüfung

Prüfbericht

TGM - VA HL 8520 vom 15. September 2017

Qualitätsstandards/Prüfrichtlinien

- QS-G 100 Ausgabe Dezember 2014
- QS-G 314 Ausgabe Oktober 2015

Produkt

Unlösbare Rohrverbindungen für metallene Gasleitungen

Pressverbinder aus Edelstahl
(Werkstoff Nr. 1.4404)

für Rohre aus Edelstahl nach GW 541

XPress Stainless Gas

in den Dimensionen 15, 18, 22, 28, 35, 42, 54, 76,1, 88,9, 108 mm Ø

MOP 5 bar/GT 5

Kategorie $II_{2H3B/P}$

zulässige Umgebungstemperatur
- 20 °C bis + 70 °C

Rohr: Außendurchmesser 15, 18, 22, 28, 35, 42, 54, 76,1, 88,9, 108 mm Ø

Weitere Angaben siehe Seite 2

ZVR 818158001

Die Verleihung erfolgt unter Zugrundelegung der Allgemeinen Geschäftsbedingungen GW 30 ÖVGW-Qualitätsmarke Produkte Gas & Wasser „Voraussetzungen für die Zuerkennung der ÖVGW-Qualitätsmarke für Produkte der Gas- und Wasserversorgung."

Wien, am 17. Oktober 2017

Dipl-Ing (FH) Alexander Schwanzer
Leiter der ÖVGW-Zertifizierungsstelle

ÖVGW
ÖSTERREICHISCHE VEREINIGUNG FÜR DAS GAS- UND WASSERFACH

Österreichische Vereinigung für das Gas- und Wasserfach
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ÖVGW GEPRÜFT

Akkreditiert durch das Bundesministerium für Wissenschaft, Forschung und Wirtschaft

ÖVGW-Zertifikat

über die Verleihung des Rechtes zur Führung der ÖVGW-Qualitätsmarke Gas

Registrierungsnummer
G 2.909

Geltungsdauer
bis Ende September 2020

Inhaber
Pegler Yorkshire Group Ltd
St. Catherines Avenue
DN4 8DF Doncaster
Großbritannien

◆ Vertrieb in Österreich
Seppelfricke-Simplex Armaturen Austria GmbH
Arlbergstraße 139
6900 Bregenz

Hersteller
Pegler Yorkshire Group Ltd / UK

Prüfungsart
Verlängerungsprüfung

Prüfbericht
TGM - VA HL 8521 vom 10. Oktober 2017

Qualitätsstandards/Prüfrichtlinien
- QS-G 100 Ausgabe Dezember 2014
- QS-G 314 Ausgabe Oktober 2015

Produkt
Unlösbare Rohrverbindungen für metallene Gasleitungen

Pressfittingssystem aus Kupfer bzw. aus Rotguss

für Kupferrohre nach EN 1057

R 250 (halbhart)
in den Dimensionen 15, 18, 22, 28 mm Ø

R 290 (hart)
in den Dimensionen 15, 18, 22, 28, 35, 42, 54 mm Ø

XPress Gas

in den Dimensionen 15, 18, 22, 28, 35, 42, 54 mm Ø

MOP 5 bar/GT 1

Kategorie $II_{2H3B/P}$

zulässige Umgebungstemperatur
- 20 °C bis + 70 °C

Weitere Angaben siehe Seite 2

ZVR 818158001

Die Verleihung erfolgt unter Zugrundelegung der Allgemeinen Geschäftsbedingungen GW 30 ÖVGW-Qualitätsmarke Produkte Gas & Wasser „Voraussetzungen für die Zuerkennung der ÖVGW-Qualitätsmarke für Produkte der Gas- und Wasserversorgung."

Wien, am 18. Oktober 2017

Dipl.-Ing (FH) Alexander Schwanzer
Leiter der ÖVGW-Zertifizierungsstelle

bsi.

By Royal Charter

Kitemark™ Certificate

This is to certify that:

VSH Fittings BV
Oude Amersfoortseweg 99
Hilversum
1212 AA
The Netherlands

Holds Certificate Number: KM 685248

In respect of:

prEN 10352:2010
Stainless steel plumbing fittings: Fittings with press ends for metallic tubes.

This issues the right and licence to use the Kitemark in accordance with the Kitemark Terms and Conditions governing the use of the Kitemark, as may be updated from time to time by BSI Assurance UK Ltd (the "Conditions"). All defined terms in this Certificate shall have the same meaning as in the Conditions.

The use of the Kitemark is authorized in respect of the Product(s) detailed on this Certificate provided at or from the above address.

For and on behalf of BSI:

Chris Lewis - Certification Director, Product Certification

First Issued: 2018-03-09
Latest Issue: 2018-03-09

Effective Date: 2018-03-09
Expiry Date: 2021-03-08

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bsi.

Kitemark™ Licence

This is to certify that:

Pegler Yorkshire Group Limited
Belmont Works
St. Catherines Avenue
Doncaster
DN4 8DF
United Kingdom

Holds Kitemark Licence Number: **KM 586758**

In respect of:
BS 8537
Press ends of plumbing fittings for use with metallic tubes

This issues the right and Licence to use the Kitemark in accordance with the Kitemark Terms and Conditions governing the use of the Kitemark, as may be updated from time to time by BSI Assurance UK Ltd (the "Conditions"). All defined terms in this Licence shall have the same meaning as in the Conditions.

The use of the Kitemark is authorized in respect of the Product(s) detailed on this Licence provided at or from the above address.

For and on behalf of BSI:

Gary Fenton, Global Assurance Director

First Issued: 31/10/2012

Latest Issue: 6/03/2014

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Minimum Distance Between Pressings & Installation Spacing

Table 21: Minimum Distances Between Pressings					
	Insertion Depth		Minimum Distance	Minimum Tube Length	
Ø [mm]	Y (mm)		X min (mm)	2 x Y + X min (mm)	
	VSH XPress Stainless Steel GAS	VSH XPress Copper GAS	VSH XPress GAS (Copper & Stainless Steel)	VSH XPress Stainless Steel GAS	VSH XPress Copper GAS
15	20	20	10	50	50
18	20	20	10	50	50
22	21	21	10	52	52
28	23	23	10	56	56
35	26	26	10	62	62
42	30	30	20	80	80
54	35	35	20	90	90
76.1	55	50	55	165	140
88.9	63	64	65	186	193
108	77	64	80	234	208

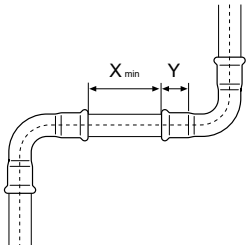


Fig. 19

Spacing

Allow sufficient clearance around each fitting to allow press jaws to be attached without hindrance.

Table 22: Pipework Clearance When Using Press Jaws				
Pipework Clearance with Press Jaws (mm)				
Size	A	B	C	D
15mm	25	28	75	131
18mm	25	28	75	131
22mm	31	35	80	150
28mm	31	35	80	150
35mm	31	44	80	170

Table 23: Pipework Clearance When Using Press Slings				
Pipework Clearance with Press Slings (mm)				
Size	A	B	C	D
42mm	75	75	115	265
54mm	85	85	120	290
66.7mm	100	100	145	345
76.1mm	115	115	165	395
88.9mm	125	125	185	435
108mm	135	135	200	470

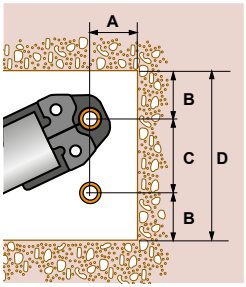


Fig. 20

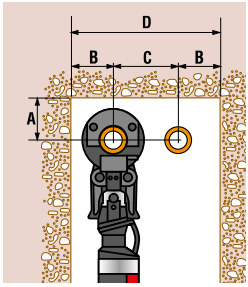
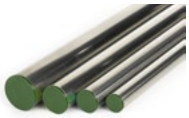


Fig. 21

Product Range

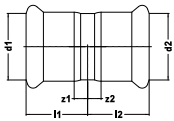
VSH XPress Stainless Steel GAS

NF100 Stainless Steel Pipe 1.4401 (AISI 316) (6m Length)



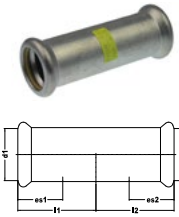
Code	Dimension	DN
53001B00	15 x 1.0	12
53001C00	18 x 1.0	15
53001D00	22 x 1.0	20
53001E00	28 x 1.2	25
53001F00	35 x 1.5	32
53001G00	42 x 1.5	40
53001H00	54 x 1.5	50
53001J00	76.1 x 2.0	65
53001K00	88.9 x 2.0	80
53001L00	108 x 2.0	100

R2701G Straight Coupling (2x Press)



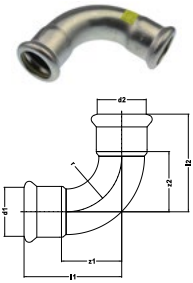
Code	Dimension	l1/l2	z1/z2
6210006	15	26	6
6210017	18	26	6
6210028	22	30	9
6210039	28	31	8
6210041	35	36	10
6210050	42	40	10
6210061	54	45	10
6212131	76.1	71	16
6212140	88.9	82	19
6212151	108	96	19

R2703G Slip Coupling (2 x Press)



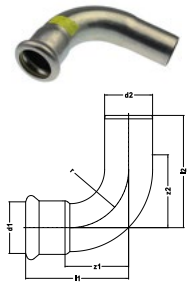
Code	Dimension	l1/l2	es1/es2
6210105	15	36	20
6210116	18	39	20
6210127	22	41	21
6210138	28	45	23
6210149	35	50	26
6210151	42	58	30
6210160	54	70	35

R2708G Bend 90° (2 x Press)



Code	Dimension	l1/l2	z1/z2	r
6210171	15	48	27	23
6210182	18	53	32	27
6210193	22	60	37	33
6210204	28	71	47	42
6210215	35	87	60	53
6210226	42	115	83	63
6210237	54	142	105	81
6212162	76.1	150	95	91
6212173	88.9	174	111	107
6212184	108	215	138	130

R2711G Bend 90° (Press x Male)

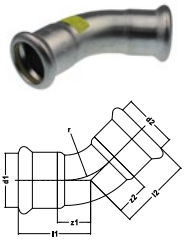


Code	Dimension	l1	l2	z1	z2	r
6210270	15 x Ø15	48	56	27	56	23
6210281	18 x Ø18	53	62	32	62	27
6210292	22 x Ø22	60	68	37	68	33
6210303	28 x Ø28	71	80	47	80	42
6210314	35 x Ø35	87	93	60	67	53
6210325	42 x Ø42	115	125	83	95	63
6210336	54 x Ø54	142	149	105	114	81

R2711G Bend 90° (Press x Male)

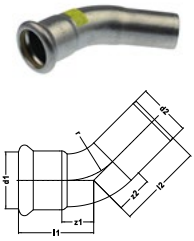
Code	Dimension	l1	l2	z1	z2	r
6212195	76.1 x Ø76.1	150	165	95	165	91
6212206	88.9 x Ø88.9	175	190	112	190	107
6212217	108 x Ø108	216	238	138	238	130

R2713G Bend 45° (2 x Press)



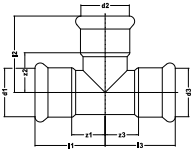
Code	Dimension	l1/l2	z1/z2	r
6210371	15	37	16	23
6210380	18	38	17	27
6210391	22	44	21	33
6210402	28	51	27	42
6210413	35	59	32	53
6210424	42	77	45	63
6210435	54	88	51	81
6212228	76.1	98	43	91
6212239	88.9	112	49	107
6212241	108	138	61	130

R2712G Bend 45° (Press x Male)



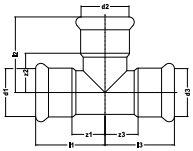
Code	Dimension	l1	l2	z1	z2	r
6210479	15 x Ø15	37	48	16	28	23
6210481	18 x Ø18	38	45	17	25	27
6210490	22 x Ø22	44	53	21	32	33
6210501	28 x Ø28	51	60	27	37	42
6210512	35 x Ø35	59	66	32	40	53
6210523	42 x Ø42	77	80	45	50	63
6210534	54 x Ø54	88	97	51	62	81
6212250	76.1 x Ø76.1	98	117	43	62	91
6212261	88.9 x Ø88.9	112	131	49	68	107
6212272	108 x Ø108	138	154	61	77	130

R2714G Equal Tee (3x Press)



Code	Dimension	l1/l3	l2	z1/z3	z2
6210787	15	37	35	16	14
6210798	18	40	35	19	14
6210809	22	41	40	18	17
6210811	28	46	45	22	21
6210820	35	51	55	24	28
6210831	42	59	61	27	29
6210842	54	71	72	34	35
6212283	76.1	116	115	61	60
6212294	88.9	156	156	68	68
6212305	108	231	231	79	78

R2715G Tee Reduced (3x Press)

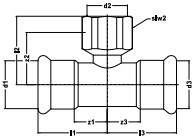


Code	Dimension	l1/l3	l2	z1/z3	z2
6210886	18 x 15 x 18	40	36	19	15
6210897	22 x 15 x 22	41	39	18	18
6210908	22 x 18 x 22	41	38	18	17
6210919	28 x 15 x 28	46	42	22	21
6210921	28 x 18 x 28	46	42	22	21
6210930	28 x 22 x 28	46	45	22	22
6210941	35 x 15 x 35	51	45	24	24
6210952	35 x 18 x 35	51	45	24	24
6210963	35 x 22 x 35	51	46	24	23
6210974	35 x 28 x 35	51	48	24	24
6210985	42 x 22 x 42	59	51	27	28
6210996	42 x 28 x 42	59	53	27	29
6211007	42 x 35 x 42	59	60	27	33
6211018	54 x 22 x 54	71	59	34	34
6211029	54 x 28 x 54	71	60	34	36
6211031	54 x 35 x 54	71	66	34	39

R2715G Tee Reduced (3x Press)

Code	Dimension	l1/l3	l2	z1/z3	z2
6211040	54 x 42 x 54	71	64	34	32
6212316	76.1 x 22 x 76.1	116	68	61	45
6212327	76.1 x 28 x 76.1	116	71	61	47
6212338	76.1 x 35 x 76.1	116	75	61	48
6212349	76.1 x 42 x 76.1	116	79	61	47
6212351	76.1 x 54 x 76.1	116	80	61	43
6212360	88.9 x 22 x 88.9	131	76	68	53
6212371	88.9 x 28 x 88.9	131	76	68	52
6212382	88.9 x 35 x 88.9	131	83	68	56
6212393	88.9 x 42 x 88.9	131	85	68	53
6212404	88.9 x 54 x 88.9	131	93	68	56
6212415	108 x 22 x 108	156	85	79	62
6212426	108 x 28 x 108	156	88	79	64
6212437	108 x 35 x 108	156	94	79	67
6212448	108 x 42 x 108	156	96	79	64
6212459	108 x 54 x 108	156	102	79	65

R2718G Tee (Press x Female Thread x Press)

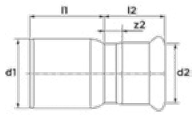


Code	Dimension	l1/l3	l2	z1/z3	z2	slw2
6211051	15 x Rp1/2 x 15	37	37	16	25	24
6211062	18 x Rp1/2 x 18	40	39	19	27	24
6211073	18 x Rp3/4 x 18	40	43	19	30	30
6211084	22 x Rp1/2 x 22	41	41	18	29	24
6211095	22 x Rp3/4 x 22	41	41	18	28	30
6211106	28 x Rp1/2 x 28	46	44	22	32	24
6211117	28 x Rp3/4 x 28	46	45	22	32	30
6211128	35 x Rp1/2 x 35	51	48	24	36	24
6211139	35 x Rp3/4 x 35	51	48	24	35	30
6211141	42 x Rp1/2 x 42	59	46	27	34	24

R2718G Tee (Press x Female Thread x Press)

Code	Dimension	l1/l3	l2	z1/z3	z2	slw2
6211150	54 x Rp1/2 x 54	71	55	34	43	30
6211161	54 x Rp3/4 x 54	71	69	34	47	24
6211172	54 x Rp2 x 54	71	58	34	45	65
6212461	76.1 x Rp3/4 x 76.1	116	81	61	59	30
6212470	76.1 x Rp2 x 76.1	116	68	61	55	65
6212481	88.9 x Rp3/4 x 88.9	131	88	68	66	30
6212492	88.9 x Rp2 x 88.9	131	87	68	74	65
6212503	108 x Rp3/4 x 108	156	86	79	73	30
6212514	108 x Rp2 x 108	156	98	79	76	65

R2707G Reducer (Male x Press)

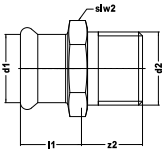


Code	Dimension	l1	l2	z2
6210591	Ø18 x 15	29	26	6
6210600	Ø22 x 15	34	26	6
6210611	Ø22 x 18	31	26	6
6210622	Ø28 x 15	47	25	5
6210633	Ø28 x 18	51	26	6
6210644	Ø28 x 22	38	29	8
6210655	Ø35 x 22	43	40	19
6210666	Ø35 x 28	43	30	7
6210677	Ø42 x 28	58	40	17
6210688	Ø42 x 35	39	40	14
6210699	Ø54 x 28	62	37	14
6210701	Ø54 x 35	78	50	24
6210710	Ø54 x 42	60	37	7
6212525	Ø76.1 x 42	101	50	20
6212536	Ø76.1 x 54	90	50	15
6212547	Ø88.9 x 54	106	50	15
6212558	Ø88.9 x 76.1	91	65	10

R2707G Reducer (Male x Press)

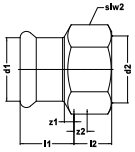
Code	Dimension	l1	l2	z2
6212569	Ø108 x 54	154	50	15
6212571	Ø108 x 76.1	131	65	10
6212580	Ø108 x 88.9	112	78	15

R2705G Straight Connector (Press x Male Thread)



Code	Dimension	l1	z2	slw2
6211238	15 x R1/2	20	32	22
6211249	18 x R1/2	20	32	22
6211251	22 x R1/2	21	47	22
6211260	22 x R3/4	21	37	36
6211271	22 x R1	21	51	27
6211282	28 x R1	23	50	36
6211304	35 x R1	26	56	46
6211293	35 x R1 1/4	26	44	36
6211315	35 x R1 1/2	26	58	50
6211326	42 x R1 1/2	30	45	50
6211337	54 x R2	35	52	65
6212591	76.1 x R2 1/2	55	70	80
6212602	88.9 x R3	63	75	95

R2702G Straight Connector (Press x Female Thread)

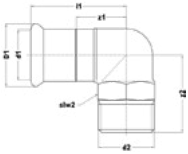


Code	Dimension	l1	l2	z1	z2	slw2
6211348	15 x Rp1/2	27	27	7	13	22
6211359	18 x Rp1/2	26	26	6	12	22
6211361	22 x Rp1/2	26	26	5	12	22
6211370	22 x Rp3/4	28	28	7	13	27
6211381	22 x Rp1	35	35	14	17	36
6211392	28 x Rp1	31	31	8	14	36
6211414	35 x Rp1	41	41	15	23	46
6211403	35 x Rp1 1/4	36	36	10	18	50

R2702G Straight Connector (Press x Female Thread)

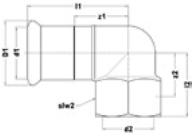
Code	Dimension	l1	l2	z1	z2	slw2
6211425	42 x Rp1 1/2	37	37	7	18	50
6211447	54 x Rp2	53	53	18	34	65

R2728G Angle Adapter 90° (Press x Male Thread)



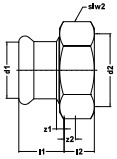
Code	Dimension	l1	z1	z2	slw2
6211458	15 x R1/2	53	32	36	22
6211469	18 x R1/2	51	30	36	22
6211471	22 x R3/4	58	35	40	28
6211480	28 x R1	63	39	44	36
6211491	35 x R1 1/4	71	44	48	46

R2709G Angle Adapter 90° (Press x Female Thread)



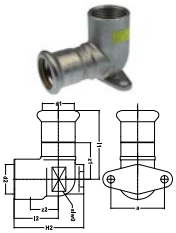
Code	Dimension	l1	l2	z1	z2	slw2
6211502	15 x Rp1/2	53	36	32	24	24
6211513	18 x Rp1/2	52	39	31	27	24
6211524	22 x Rp3/4	57	46	34	33	30
6211535	28 x Rp1	71	54	47	38	38
6211546	35 x Rp1 1/4	72	62	45	45	46

R2741G Coupling with Nut (Press x Female Thread)



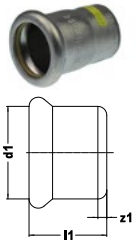
Code	Dimension	l1	l2	z1	z2	slw2
6211801	15 x G7/8	39	8	19	2	30
6211581	22 x G1 1/8	43	8	22	2	37
6211590	28 x G1 3/8	45	10	22	2	46

R2716G Wallplate 90° (Press x Female Thread)



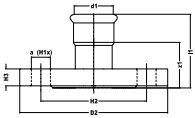
Code	Dimension	l1	l2	z1	z2	H2	a
6211557	15 x Rp1/2	46	31	25	19	43	34
6211568	18 x Rp1/2	47	31	26	19	44	34
6211579	22 x Rp3/4	52	35	29	22	51	40

R2729G Stop End (1 x Press)



Code	Dimension	l1	z1
6212052	15	37	16
6212063	18	40	19
6212074	22	41	18
6212085	28	46	22
6212096	35	51	24
6212107	42	59	27
6212118	54	72	35

R2726G Flanged Connector PN10/16



Code	Dimension	l1	z1	H2	H3	a	# Holes (H1)
6211601	22 (DN 20)	59	39	75	12	14	4
6211612	28 (DN 25)	65	47	85	14	14	4
6211623	35 (DN 32)	70	52	100	15	18	4
6211634	42 (DN 40)	77	59	110	16	18	4
6211645	54 (DN 50)	86	75	125	18	18	4
6212613	76.1 (DN 65)	126	71	145	18	18	4
6212624	88.9 (DN 80)	147	84	160	20	18	8
6212635	108 (DN 100)	167	90	180	20	18	8

R2742G Flat Seal (Yellow, NBR) for VSH XPress Stainless Steel GAS

Code	Dimension
6211689	22
6211691	28
6211700	35
6211711	42
6211722	54

R2755G O-Ring Standard (Yellow, HNBR) for VSH XPress Stainless Steel GAS

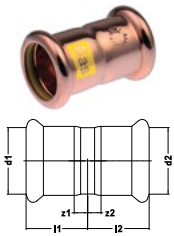
Code	Dimension
6211911	15
6211920	18
6211931	22
6211942	28
6211953	35
6211964	42
6211975	54
6218102	76.1
6218113	88.9
6218124	108

VSH XPress Copper GAS

COPPERFIX Copper Pipe (R250/R290) (5.8m Length)

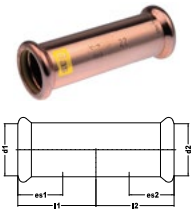
Code	Dimension	DN
5620XB00	15 x 0.7	15
5620XC00	18 x 0.8	18
5620XD00	22 x 0.9	20
5620XE00	28 x 0.9	25
5630XF00	35 x 1.2	32
5630XG00	42 x 1.2	40
5630XH00	54 x 1.2	50
5630XI00	66.7 x 1.2	65
5630XJ00	76.1 x 1.5	80
5630XL00	108 x 1.5	100

G7270 Straight Coupling (2 x Press)



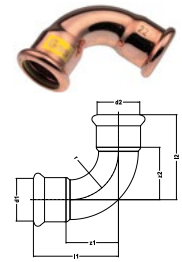
Code	Dimension	l1/l2	z1/z2
4804437	15	22	2
4804448	18	22	2
4804459	22	23	2
4804461	28	25	2
4804470	35	28	2
4804481	42	35	4
4804492	54	42	5
GAS-39302	66.7	55	5
GAS-39303	76.1	55	5
GAS-39305	108	72	5

G7270S Slip Coupling (2 x Press)



Code	Dimension	l1/l2	es1/es2
4804503	15	40	20
4804514	18	40	20
4804525	22	42	21
4804536	28	46	23
4804547	35	50	25
4804558	42	60	30
4804569	54	71	35
GAS-39307	66.7	55	5
GAS-39308	76.1	55	5
GAS-39310	108	72	5

G7002A Bend 90° (2 x Press)

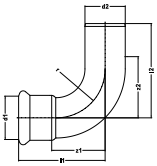


Code	Dimension	l1/l2	z1/z2	diam r
4803832	15	38	17	18
4803843	18	42	22	22
4803854	22	47	26	26
4803865	28	56	34	34
4803876	35	68	42	42
4803887	42	80	50	50
4803898	54	100	65	65
GAS-39341	66.7	132	87	80
GAS-39342	76.1	142	92	91
GAS-39344	108	201	135	130

G7001A Bend 90° (Press x Male)

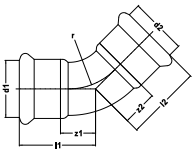
Code	Dimension	l1	l2	z1	z2	r
4803766	15 x Ø15	36	50	16	30	18
4803777	18 x Ø18	42	53	22	33	22
4803788	22 x Ø22	47	58	27	38	26
4803799	28 x Ø28	58	64	34	40	34

G7001A Bend 90° (Press x Male)



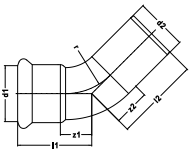
Code	Dimension	l1	l2	z1	z2	r
4803801	35 x Ø35	69	82	44	57	42
4803810	42 x Ø42	81	101	52	72	50
4803821	54 x Ø54	100	120	66	86	65
GAS-39346	66.7 x Ø66.7	130	175	78	125	80
GAS-39347	76.1 x Ø76.1	143	150	93	100	91
GAS-39349	108 x Ø108	197	208	130	141	130

G7041 Bend 45° (2 x Press)



Code	Dimension	l1/l2	z1/z2	r
4803975	15	28	8	18
4803986	18	29	9	22
4803997	22	31	12	26
4804008	28	37	16	34
4804019	35	44	18	42
4804021	42	51	21	50
4804030	54	62	27	65
GAS-39351	66.7	85	35	80
GAS-39352	76.1	91	45	91
GAS-39354	108	125	59	130

G7040 Bend 45° (Press x Male)

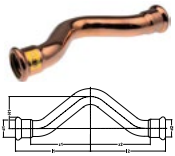


Code	Dimension	l1	l2	z1	z2	r
4803909	15 x Ø15	28	37	8	17	18
4803911	18 x Ø18	29	39	9	19	22
4803920	22 x Ø22	32	44	11	23	26
4803931	28 x Ø28	37	47	14	24	34
4803942	35 x Ø35	43	58	17	32	42
4803953	42 x Ø42	51	71	21	41	50
4803964	54 x Ø54	62	82	27	47	65
GAS-39356	66.7 x Ø66.7	85	88	35	38	80

G7040 Bend 45° (Press x Male)

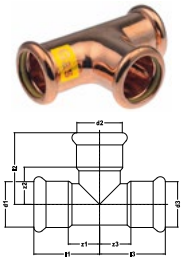
Code	Dimension	l1	l2	z1	z2	r
GAS-39357	76.1 x Ø76.1	90	97	40	54	91
GAS-39359	108 x Ø108	121	136	58	69	130

G7085 Crossover (2 x Press)



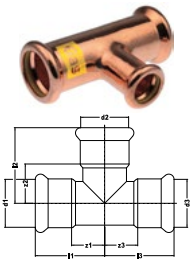
Code	Dimension	l1/l2	z1/z2	H1
4804041	15	70	50	34
4804063	22	85	64	50

G7130 Equal Tee (3 x Press)



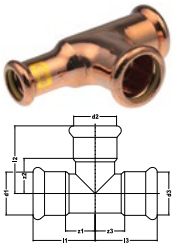
Code	Dimension	l1/l2/l3	z1/z2/z3
4804107	15	32	12
4804118	18	34	14
4804129	22	37	16
4804131	28	42	19
4804140	35	50	24
4804151	42	58	28
4804162	54	69	34
GAS-39361	66.7	l1 = l3 = 95 l2 = 111	z1 = z3 = 45 z2 = 62
GAS-39362	76.1	l1 = l3 = 101 l2 = 119	z1 = z3 = 51 z2 = 69
GAS-39364	108	159	92

G7125 Tee Reduced (3 x Press)



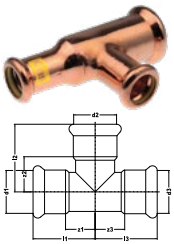
Code	Dimension	l1/l3	l2	z1/z3	z2
4804173	18 x 15 x 18	34	35	14	15
4804195	22 x 15 x 22	37	38	16	18
4804206	22 x 18 x 22	37	38	16	18
4804228	28 x 15 x 28	42	41	19	21
4804241	28 x 22 x 28	42	41	19	20
4804250	35 x 22 x 35	45	45	19	24
4804261	35 x 28 x 35	50	44	24	21
4804272	42 x 28 x 42	56	49	26	26
4804283	42 x 35 x 42	56	50	26	24
4804294	54 x 42 x 54	69	64	34	34
GAS-39368	66.7 x 28 x 66.7	76	67	26	43
GAS-39369	66.7 x 35 x 66.7	80	70	29	43
GAS-39370	66.7 x 42 x 66.7	82	76	32	41
GAS-39371	66.7 x 54 x 66.7	88	78	47	43
GAS-39372	76.1 x 22 x 76.1	73	73	22	50
GAS-39373	76.1 x 28 x 76.1	77	73	26	50
GAS-39374	76.1 x 35 x 76.1	80	78	30	53
GAS-39375	76.1 x 42 x 76.1	103	106	55	70
GAS-39376	76.1 x 54 x 76.1	93	85	41	50
GAS-39382	108 x 54 x 108	109	125	40	91
GAS-39383	108 x 66.7 x 108	117	136	50	86
GAS-39384	108 x 76.1 x 108	120	136	56	86

G7126 Tee Reduced (3 x Press)



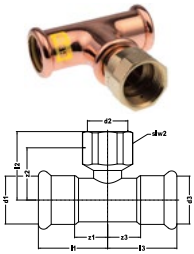
Code	Dimension	l1/l2	l3	z1/z2	z3
4804217	22 x 22 x 15	37	46	16	26

G7127 Tee Reduced (3 x Press)



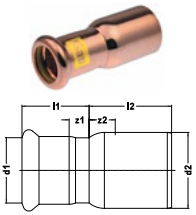
Code	Dimension	l1	l2	l3	z1	z2	z3
4804184	22 x 15 x 15	37	44	43	16	18	23

G6130G Tee Branch Female (Press x Female Thread x Press)



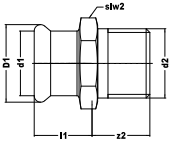
Code	Dimension	l1/l3	l2	z2	z1/z3	slw2
4804833	15 x Rp1/2 x 15	32	59	48	12	22
4804844	18 x Rp1/2 x 18	42	24	8	22	22
4804855	22 x Rp1/2 x 22	34	65	50	16	22
4804866	22 x Rp3/4 x 22	37	67	51	16	30
4804877	28 x Rp1/2 x 28	44	29	14	19	22
4804888	28 x Rp3/4 x 28	41	34	14	19	30
4804899	35 x Rp1/2 x 35	50	34	19	16	22
4804901	35 x Rp1 x 35	50	34	14	24	46
4804910	42 x Rp1/2 x 42	50	38	23	19	48
4804932	54 x Rp1/2 x 54	69	44	29	26	65
GAS-39386	76.1 x Rp1/2 x 76.1	65	48	30	15	-
GAS-39388	108 x Rp1/2 x 108	82	63	-	16	-

G7243 Reducer (Male x Press)



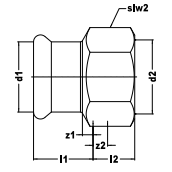
Code	Dimension	l1	l2	z1	z2
4804305	Ø18 x 15	24	23	4	3
4804316	Ø22 x 15	24	28	4	7
4804327	Ø22 x 18	24	26	4	5
4804338	Ø28 x 15	25	37	4	14
4804349	Ø28 x 18	24	26	4	5
4804351	Ø28 x 22	25	30	4	7
4804360	Ø35 x 22	29	39	9	13
4804371	Ø35 x 28	28	35	5	9
4804382	Ø42 x 22	25	49	4	19
4804393	Ø42 x 28	27	44	4	14
4804404	Ø42 x 35	35	38	8	8
4804415	Ø54 x 35	35	53	9	18
4804426	Ø54 x 42	40	47	9	12
GAS-39319	Ø66.7 x 28	37	72	14	22
GAS-39320	Ø66.7 x 35	40	69	14	19
GAS-39321	Ø66.7 x 42	43	67	13	17
GAS-39322	Ø66.7 x 54	49	63	14	13
GAS-39323	Ø76.1 x 35	39	74	13	24
GAS-39324	Ø76.1 x 42	43	70	13	20
GAS-39325	Ø76.1 x 54	52	64	17	14
GAS-39327	Ø76.1 x 66.7	66	60	16	10
GAS-39334	Ø108 x 42	47	106	17	39
GAS-39335	Ø108 x 54	54	102	20	35
GAS-39337	Ø108 x 66.7	70	96	20	29
GAS-39338	Ø108 x 76.1	70	92	20	25

G6243G Straight Connector (Press x Male Thread)



Code	Dimension	l1	z2	slw2
4803414	15 x R1/2	20	17	21
4803425	15 x R3/4	20	19	25
4803436	18 x R1/2	20	17	25
4803447	18 x R3/4	20	19	25
4803458	22 x R1/2	21	17	30
4803469	22 x R3/4	21	19	30
4803471	22 x R1	21	21	32
4803480	28 x R3/4	23	20	36
4803491	28 x R1	23	10	36
4803502	28 x R1 1/4	23	13	40
4803513	35 x R1	26	22	41
4803524	35 x R1 1/4	26	27	41
4803535	42 x R1 1/4	30	28	51
4803546	42 x R1 1/2	30	28	51
4803557	54 x R2	35	28	57
GAS-39311	66.7 x R2 1/2	50	25	74
GAS-39313	76.1 x R3	50	39	77
GAS-39315	108 x R4	68	38	107

G6270G Straight Connector (Press x Female Thread)

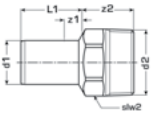


Code	Dimension	l1	l2	z1	z2	slw2
4803568	15 x Rp1/2	19	18	2	8	25
4803579	15 x Rp3/4	17	19	1	8	30
4803581	18 x Rp1/2	19	18	1	8	25
4803590	18 x Rp3/4	20	19	2	9	30
4803601	22 x Rp1/2	19	17	1	7	30
4803612	22 x Rp3/4	20	19	1	9	30
4803623	28 x Rp1	23	22	1	10	37
4803634	35 x Rp1 1/4	25	25	1	11	46

G6270G Straight Connector (Press x Female Thread)

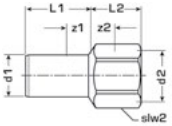
Code	Dimension	l1	l2	z1	z2	slw2
4803645	42 x Rp1 1/2	27	25	1	11	48
4803656	54 x Rp2	32	25	1	11	48

COF453 Straight Connector (Male x Male Thread)



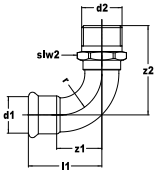
Code	Dimension	l1	z1	z2	slw2
52704B02	15 x R1/2	30	10	21	19
52704C02	18 x R1/2	30	10	20	19
52704C04	18 x R3/4	30	10	23	25
52704D02	22 x R1/2	30	9	21	19
52704D04	22 x R3/4	30	9	23	25
52704E05	28 x R1	32	9	26	32
52704F06	35 x R1 1/4	35	9	29	36
52704G07	42 x R1 1/2	51	21	29	46

COF454 Straight Connector (Male x Female Thread)



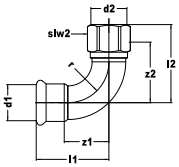
Code	Dimension	l1	l2	z1	z2	slw2
52705B02	15 x Rp1/2	30	18	10	3	22
52705C02	18 x Rp1/2	30	17	10	3	22
52705C04	18 x Rp3/4	30	20	10	3	30
52705D02	22 x Rp1/2	30	17	9	2	22
52705D04	22 x Rp3/4	30	19	9	3	30
52705E05	28 x Rp1	32	22	9	3	37
52705F05	35 x Rp1	35	21	9	2	37
52705F06	35 x Rp1 1/4	35	25	9	4	46
52705G07	42 x Rp1 1/2	51	25	21	4	48
52705H09	54 x Rp2	56	30	21	4	65

G6092G Angle Adapter 90° (Press x Male Thread)



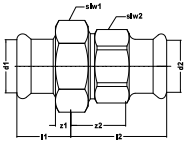
Code	Dimension	l1	z1	z2	slw2	r
4804756	15 x R1/2	37	18	67	19	18
4804767	18 x R1/2	64	44	34	19	22
4804778	18 x R3/4	60	40	37	25	22
4804789	22 x R3/4	48	27	79	30	26
4804791	28 x R1	57	35	88	36	34
4804800	35 x R1 1/4	80	55	59	41	42
4804811	42 x R1 1/2	104	74	57	51	50
4804822	54 x R2	104	69	80	57	65

G6090G Angle Adapter 90° (Press x Female Thread)



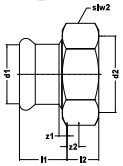
Code	Dimension	l1	l2	z1	z2	slw2	r
4804646	15 x Rp1/2	55	26	35	12	22	18
4804657	15 x Rp3/4	63	29	43	12	30	18
4804668	18 x Rp1/2	55	25	35	9	22	22
4804679	18 x Rp3/4	61	29	41	11	30	22
4804681	22 x Rp1/2	56	25	35	14	22	26
4804690	22 x Rp3/4	62	29	41	13	30	26
4804701	22 x Rp1	66	38	45	21	37	26
4804712	28 x Rp1	73	37	50	18	37	34
4804723	35 x Rp1 1/4	83	43	57	19	46	42
4804734	42 x Rp1 1/2	88	46	60	27	48	50
4804745	54 x Rp2	104	55	72	33	65	65

G6340 Straight Union (2 x Press)



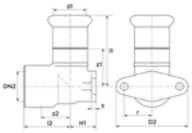
Code	Dimension	l1	l2	z1	z2	slw1	slw2
4803667	15	25	36	5	16	34	28
4803689	22	29	38	8	17	41	36
4803691	28	34	41	11	18	48	41
4803700	35	36	46	10	20	58	50

G6360 Coupling with Nut (Press x Female Thread)



Code	Dimension	l1	l2	z1	z2	slw2
4803733	15 x G7/8	20	14	4	9	34
4803755	28 x G1 3/8	23	22	4	18	48

G6471G Wallplate 90° (Press x Female Thread)

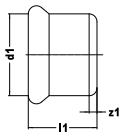


Code	Dimension	l1	l2	z1	z2	H2	a
4804954	15 x Rp1/2	51	22	31	11	43	40
4804965	18 x Rp1/2	51	22	31	10	44	40
4804976	22 x Rp3/4	61	31	40	15	51	40

G7301 Stop End (1 x Press)

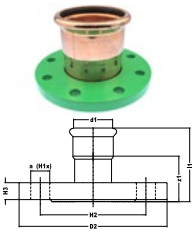
Code	Dimension	l1	z1
4804571	15	20	2
4804580	18	20	2
4804591	22	21	2

G7301 Stop End (1 x Press)



Code	Dimension	l1	z1
4804602	28	23	2
4804613	35	26	2
4804624	42	30	2
4804635	54	35	2
GAS-39390	66.7	50	2
GAS-39391	76.1	50	2
GAS-39393	108	67	2

G7510 Flanged Connector PN16



Code	Dimension	l1	D2	H2	H3	a	# Holes (H1)
GAS-39281	66.7 (DN 65)	103	185	145	20	18	4
GAS-39282	76.1 (DN 65)	103	200	160	20	18	8
GAS-39284	108 (DN 100)	126	220	180	20	18	8

R2755G O-Ring Standard (Yellow, HNBR) for VSH XPress Copper GAS

Code	Dimension
6211911	15
6211920	18
6211931	22
6211942	28
6211953	35
6211964	42
6211975	54
6218102	76.1
6218113	88.9
6218124	108

Accessories

Stainless Steel Insertion Depth Gauge (Blue)

Code	Dimension
5401900	15 - 108mm

Copper Insertion Depth Gauge (Orange)

Code	Dimension
	15 - 108mm

REMs Hand Pipe Deburrer

Code	Dimension
RM113825	15 - 35mm
RM113830	15 - 54mm

REMs Ras Cu-Inox Wheel Pipe Cutter

Code	Description
RM113400	For 6mm to 64mm pipe
RM113500	For 64mm to 120mm pipe

REMs Cento Electic Pipe Cutting Machine

Code	Description
RM845001	Electric Pipe Cutting Machine Basic Pack
RM845002	Battery Powered Cutting Machine 22V Basic Pack

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