

PAKTERMO

PAKTERMO & PAKTERMO DUO CSST EN 15266

GAS INSTALLATION
SYSTEM IN BUILDINGS

TECHNICAL INFORMATION
INSTALLATION - WARNINGS

www.paktermo.com

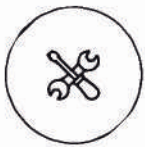


KM 696197

CSST EN 15266

GAS INSTALLATION
SYSTEM IN BUILDINGS

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Easy and Quick Installation

The problems occurring due to using additional parts at turnings and joints during installation with rigid pipe system is removed by PAKTERMO ans PAKTERMO DUO CSST system.

Corrugated Stainless Steel Tub-ing System enables easier and quicker installation than tradi-tional piping systems.



Durability

Tubing is made of high quality stainless steel and the fittings are made of copper alloy raw material. This means more durable and healthier system.



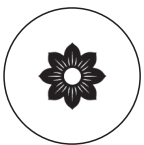
Earthquake Resistant

PAKTERMO ans PAKTERMO DUO CSST System is safer than rigid copper or steel pipes due to its flexibility at places which are risky of earthquake.

Flexibility of the system eliminates the risk of gas leakage.

CSST EN 15266

GAS INSTALLATION SYSTEM IN BUILDINGS



Decorative and Aesthetic

The tubes are covered with PVC ducts to provide more aesthetic appearance.



Safe

PAKTERMO CSST System is safe for gas leakage risk due to using less joints than rigid pipe installation.

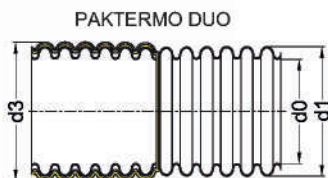
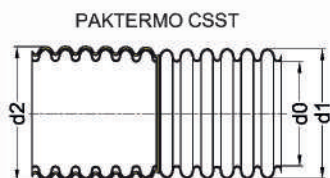
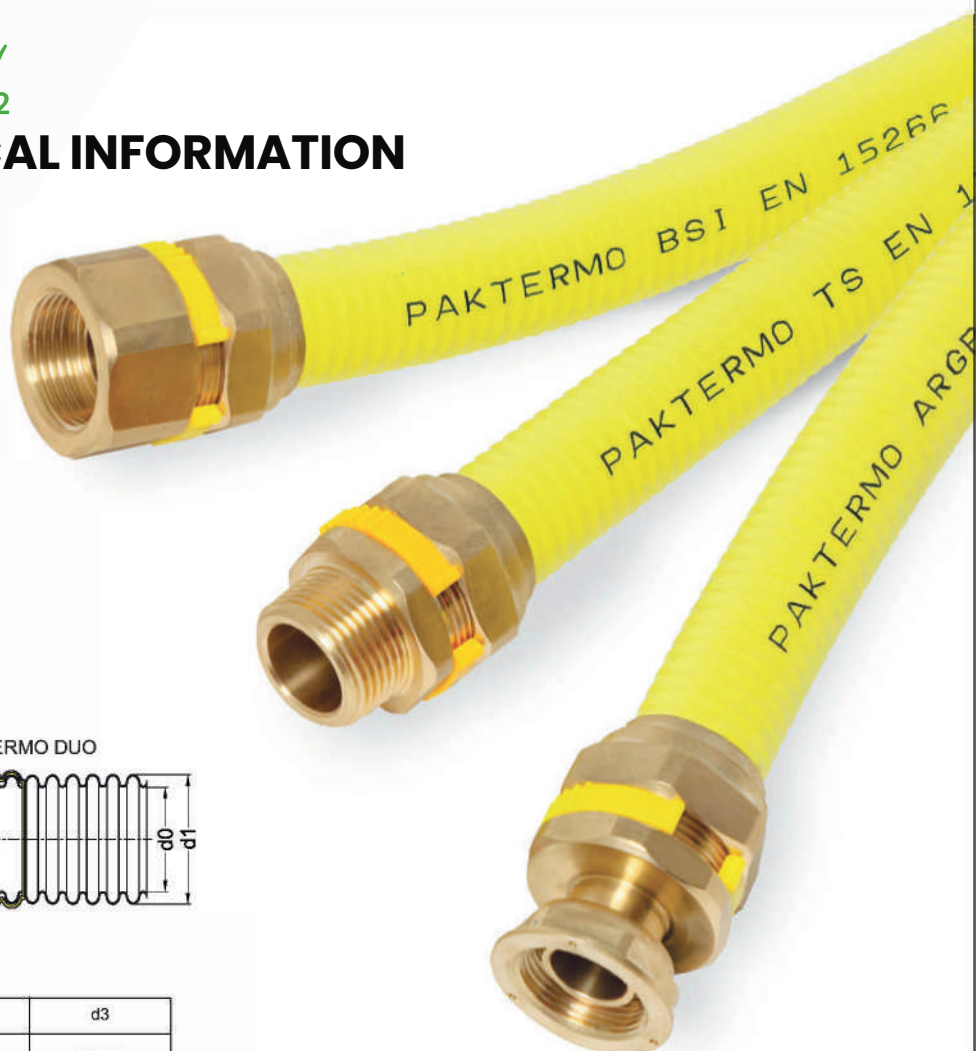


Easy Storage and Handling

PAKTERMO CSST System needs minimum storage area due to its flexible structure. Handling and transportation is easier than rigid pipe systems.



PAKTERMO X_2 CSST TECHNICAL INFORMATION



CODE	DIMENSION	d0	d1	d2	d3
P2615	DN15	16,00	21,40	22,50	24,70
P2620	DN20	20,00	24,30	25,40	27,60
P2625	DN25	25,00	31,20	32,30	34,50
P2632	DN32	32,00	38,70	39,80	42,00
P2640	DN40	40,00	46,70	47,90	50,10
P2650	DN50	50,00	58,00	59,20	61,40

dimensions in millimeters

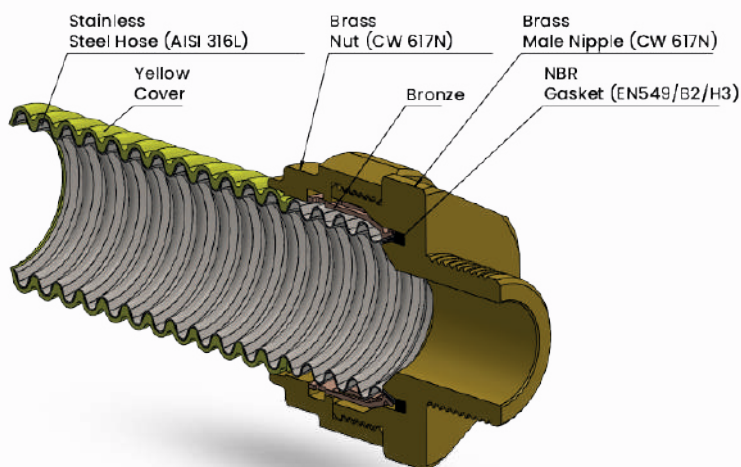
Safe Installation System

Stainless steel pliable corrugated tubing kit for gas installation with an operating pressure up to 0,5 bar. It is a very easy, quick and safety gas installation system.

Flexible tube is made of high quality stainless steel and it is heat treated to make it more pliable. Yellow polyolefin coating protects the tube from external influences and corrosion.

PAKTERMO and PAKTERMO DUO CSST System considerably reduces labor time. More practical and safety installation can be realized by Push Fit system.

PAKTERMO and PAKTERMO DUO CSST System is produced and offered to the market with a total quality approach from the production until the installation.



PAKTERMO X_2

CSST FITTINGS

The PAKTERMO and PAKTERMO DUO CSST fittings system is Push Fit system.
The fittings system is the design of PAKTERMO and it is patented.

PAKTERMO CSST fittings are available for all size of PAKTERMO and PAKTERMO DUO CSST hoses with wide range.

"T" Socket



CODE	DIMENSION
P26F302	DN20XDN20XDN20
P26F312	DN25XDN20XDN20
P26F313	DN20XDN25XDN20
P26F314	DN25XDN25XDN20
P26F306	DN25XDN20XDN25
P26F304	DN25XDN25XDN25
P26F319	DN32XDN25XDN20
P26F305	DN32XDN25XDN25
P26F317	DN25XDN32XDN25
P26F315	DN32XDN25XDN32
P26F316	DN32XDN32XDN32

Male (conic) Socket



CODE	DIMENSION
P26FI01	DN15X1/2"
P26FI02	DN20X1/2"
P26FI03	DN25X3/4"
P26FI04	DN25X1"
P26FI05	DN32X1.1/4"
P26FI20	DN40X1.1/4"
P26FI21	DN40X1.1/2"
P26.FI.24	DN50X2"

Male (cylindric) Socket



CODE	DIMENSION
P26FI06	DN15X1/2"
P26FI07	DN20X3/4"
P26FI08	DN25X1"
P26FI09	DN32X1.1/4"

Female Socket



CODE	DIMENSION
P26FM01	DN15X1/2"
P26FM02	DN20X3/4"
P26FM03	DN25X3/4"
P26FM04	DN25X1"
P26FM05	DN32X1.1/4"
P26FM06	DN32X1"
P26FM07	DN20X1/2"

Female Socket - Swivel Nut



CODE	DIMENSION
P26F9	DN15X1/2"
P26F10	DN20X1/2"
P26F11	DN20X3/4"
P26F12	DN25X3/4"
P26F13	DN25X1"
P26F14	DN32X1"
P26F15	DN32X1.1/4"

Union Socket



CODE	DIMENSION
P26F201	DN15XDN15
P26F202	DN20XDN20
P26F203	DN25XDN25
P26F204	DN32XDN32
P26F205	DN40XDN40
P26F206	DN50XDN50

Sweat Connection Socket



CODE	DIMENSION
P26F22	DN15X(14X1)
P26F16	DN20X(22X1)
P26F17	DN25X(22X1)
P26F18	DN25X(28X1)
P26F19	DN32X(22X1)
P26F20	DN32X(28X1)

Copper Compression S.



CODE	DIMENSION
P26F2501	DN15X15mm
P26F2502	DN20X15mm
P26F2503	DN20X22mm
P26F2504	DN25X22mm
P26F2505	DN25X28mm
P26F2506	DN32X28mm
P26F2507	DN32X35mm

Female Connection Socket



CODE	DIMENSION
P26F4	DN15XM20X1.5
P26F5	DN20XM20X1.5

90° Elbow



CODE	DIMENSION
P26F23	DN20XG4"
P26F24	DN20XG3/4"

CSST Hose Cutter



CODE	DIMENSION
15HKA	DN15-DN50

Hose Protector



CODE	DIMENSION
15I011	DN15-DN32



PAKTERMO N_2 CSST INSTALLATION

The purpose of this installation guide is to define the best practices for the realization as well as the requirements of tests of pipes made from PAKTERMO stainless steel foldable pipe kits for the distribution of gas in buildings with a pressure of less than or equal to 0.5 bar.

PAKTERMO Pipe Kits are prescribed for the use of the second and third families of gases in connection with:

- New facilities,
- Replacements of existing installations, or,
 - a) New Ceilings in Unfinished Rooms/Basements – CSST fittings originally installed in accessible ceiling locations can be concealed in the event a ceiling is installed at a later date.
 - b) Repairs to Existing Tubing Runs – Damaged tubing runs shall be repaired in accordance with the instructions in this guide. The repair can result in a line splice that may ultimately be located in a concealed location.
 - c) Concealed tubing shall be protected from puncture threats, using the shielding devices specified by the manufacturer, at all points of penetration through studs, joists, plates or similar structures.



- Expansion or modification of existing installations. A concealed tubing can be modified to permit an extension to another appliance location provided there is sufficient capacity to supply both appliances at the same time. If an accessible location for the modification is not available, the existing tubing run can be modified with a tee fitting which will result in a concealed fitting behind the wallboard.

The sizing of facilities fueled by commercial propane, which are likely to be converted later into natural gas, must be calculated for the use of natural gas.

Paktermo Pipe Kits are ready-to-assemble kits that seamlessly create a gas installation downstream of the general cut-off device.

The kits are made of stainless steel foldable pipe crowns coated with yellow outer protective sheath, mechanical junction fittings, branch elements and support clamps.

The Paktermo foldable pipe kits are once assembled, a waterproof metal pipe. Nuts are tight in abutment (zero clearance)

Paktermo Foldable Pipe Kits can be used in conjunction with other piping systems permitted for gas distribution in buildings.

Foldable stainless steel corrugated pipe kit for the distribution of second and third families of gases in gas installations for the primary, residential, commercial and industrial sectors with maximum service pressure (MOP):

– less than or equal to 0.5 bar for pipe of nominal diameter 15,20,25,32 and 40 (class 1).

TERMS & DEFINITION

Radius Of Curvature

Minimum bending radius

Minimum radius to which the foldable corrugated pipe is designed to work. This radius of curvature corresponds to a given pressure drop, expressed in equivalent length (see the section loss of load).

Recommended bend radius

The nominal radius at which the foldable corrugated pipe is designed to operate. This radius of curvature corresponds to a loss of load equivalent to the elongated length of the elbow.

CSST mechanical connections

Minimum radius to which the foldable corrugated pipe is designed to work. This radius of curvature corresponds to a given pressure drop, expressed in equivalent length (see the section loss of load).

Couplings

CSST connector for connecting two sections of foldable pipes

End fittings

CSST connector for assembling a collapsible hose to an external component

Specific Installation Practices

The pipes are assembled by hand with tools specific to the PAKTERMO pipe kits

It is forbidden to weld or braze components of PAKTERMO pipe kits

In the case of extension or renovation, the joining of an existing copper pipe section with the PAKTERMO pipe kits must be made using the special CSST and CSST pipe transition fitting and in accordance with the rules applicable art.

The taps are made using tees specific to the CSST pipe kits. The use of unspecified fittings and any other type of stitching is prohibited.

The unwinding of the crowns must be carried out carefully, avoiding twisting, crushing and the application of excessive forces (stretching).

The ends of the foldable pipes must always be closed with their plastic plugs. These plugs will be removed only when mounting the end fittings. This procedure avoids the intrusion of foreign matter into the pipe during its installation.

The routing of the foldable pipes must prevent it from any contact with sharp or projecting edges. If the outer sheath of CSST collapsible tubing is removed locally or damaged during pipe laying, it must be completely reconstituted over the entire length of exposed stainless steel. This can be done with the CSST protection strip or heat-shrink sleeves. When assembling fittings, in case of stripping of the collapsible pipe, the use of the protective strip is imperative to rebuild the sheath; in addition, it must cover the end of the fitting in contact with the pipe.

Make lengths in one piece whenever possible. The vacuity of the crowns or lengths of collapsible pipe must be checked before any implementation.

SUPPORTS FOR PIPELINES

The minimum distance between 2 collars in a rectilinear section, a wall penetration or a change of direction is given in the table below. A collar must be placed in the immediate vicinity (max. 100 mm in each direction) of any accessory or meter if it does not have its own fixation.

Recommendation on the distances to be respected between the supports

Diameter of Pipe	Maximum spacing in straight sections		Maximum spacing for a change of direction
	Horizontal Sections	Vertical Sections	
DN15	500	1000	500
DN20	500	1000	500
DN25	600	1200	600
DN32	750	1500	750
DN40	1000	1750	900
DN50	2000	2500	2000

"A clamp must be installed in the immediate vicinity (100 mm maximum in each direction) of any gas meter if it does not have a clean fastener."

Specific Installation Practices

Metal gas pipelines inside the buildings as well as those placed outside and forming an integral part of the building must be connected to the main equipotential bonding via the connection. When the pipe enters the building, the equipotential bonding must be carried out downstream of the insulating fitting if it exists. Outside pipeline means the building, a pipe located on the front of the building, for example a boiler supply pipe or mini-boiler room located on the terrace.

Note: It is forbidden to use the gas pipes as earth ground

Clips Size

PAKTERMO CSST and PAKTERMO Duo are flexible gas piping systems that have larger outside diameters compared to rigid steel or copper pipes of similar sizes. Due to their larger diameters, the clip or support size required for PAKTERMO is typically considered as bigger size up in the clipping range. Please check the outer diameter of pipe from the pipe sizing table and choose the clip size according to this information. The type of clip or support used will depend on the specific installation requirements. In most cases, either metal clips or plastic clips with securing devices are used. These clips provide stability and support for the PAKTERMO and PAKTERMO Duo CSST system. It's important to follow the manufacturer's guidelines and consult with a professional installer or expert to determine the appropriate clip or support size and type for your specific Paktermo or Paktermo Duo installation.

PAKTERMO CSST FOR HYDROGEN

PAKTERMO and PAKTERMO DUO CSST System is certified for Hydrogen by BSI.

As a fuel source, hydrogen and natural gas have a number of similarities including safety considerations, transportability and versatility. In addition, hydrogen is the lowest carbon fuel at the point of use. As such, it is expected to be a significant contributor in the world's shift to a cleaner and greener economy, by diversifying the energy mix and helping to meet emission reduction targets. On this basis, hydrogen represents an excellent fuel alternative in a range of applications including transportation, power production and heating, both process heating (industrial) and space heating (residential and commercial). With increasing interest in hydrogen as a fuel source, blending hydrogen with natural gas provides an opportunity to increase hydrogen demand while lowering carbon emissions. This blended fuel can be used in many applications in place of pure natural gas. Currently, blend ratios of up to 20% hydrogen are being tested.

■ PROHIBITIONS (REMINDER)

- It is forbidden to borrow building voids (floor slabs ...)
- It is forbidden to install a gas pipeline in the same duct as electric columns
- The gas piping must not be in contact with the ducts used to the evacuation of combustion products. Fixing on the flue is prohibited.
- It is forbidden to use components not specified by PAKTERMO for collapsible pipe kits
 - The use of foreign components in the PAKTERMO and PAKTERMO DUO system will cause the warranty to lapse.
 - The use of open flame on pipes or fittings is strictly forbidden
- Engraving without a scabbard in concrete is forbidden
- The use of mechanical connections in built-in, engraved, built-in runs in ducts or false ceilings is prohibited

■ INSTALLATION

1. OUTDOOR INSTALLATION

PAKTERMO and PAKTERMO DUO CSST products are approved for installation where exposure to outdoor environments can occur. The following guidelines shall be followed when installing PAKTERMO and PAKTERMO DUO CSST outdoors to protect tubing and fittings from the effects of weather.

A. The covering shall remain intact as much as practical for the given installation. Any portion of exposed stainless steel shall be wrapped with tape (e.g., PVC, Self-Fusing Silicone) or sleeved (e.g., PVC, Polyolefin) to prevent corrosive attack by acid wash or other caustic compounds that may be present. If contact with caustic compounds should occur, ensure that all traces are immediately removed to prevent premature corrosion failure.

B. PAKTERMO and PAKTERMO DUO CSST joint fittings shall be protected from the effects of weather when used outdoors. After the connection is made to outdoor equipment, the fitting assembly shall be wrapped with tape (e.g., PVC, Self-Fusing Silicone) or by applying shrink sleeves (e.g., PVC, Polyolefin) around the entire assembly.

C. When installed outdoors between grade and 1.83 m (6 ft) above, PAKTERMO CSST must be protected inside non-metallic conduit or installed in a location where it will not be subjected to mechanical damage.

When routing pipework, consideration shall be given to the soil type in which it is to be laid and its likely corrosion impact over time.

Where pliable corrugated (stainless steel) tube is to be buried externally, it shall be:

a) Directly buried pliable corrugated (stainless steel) tube which:
the manufacturer's instructions specifically allow direct burial;
is installed in accordance with the manufacturer's instructions; and
has a factory-applied cover with a minimum thickness of 0.5 mm, manufactured from a non-chlorinated material of a synthetic polymer or elastomer with a total chloride content not exceeding 50 ppm; or

b) Laid inside a buried outer pipe conforming to sleeves or a covered channel which terminates either above ground or in a suitable inspection pit, such as to prevent the accumulation of water in the outer pipe or duct, while still enabling periodic inspection.

2. UNDERGROUND INSTALLATION

The buried pipe sections will be placed under sleeves. They will be made in a single section of tube; **the use of couplings or mechanical joints on the path of underground sections is prohibited.**

The sleeves must resist corrosion. The study of the route will take into account the risks of shearing or crushing the pipework. Care must be taken to avoid entry of water into the sheath; at the ends, the annular space will be closed by a bead of silicone for example. Underground piping must be indicated by a warning device placed 0.20 m above the piping.

Crossing manholes and non-ventilated volumes is prohibited unless the piping is placed in a continuous sheath over the entire length of the work projecting on both sides of the outside and sealed in the crossing (The use of couplings or mechanical joints on the course is forbidden). The crossing distance with electrical, telephone, conductor and earth conductors, lightning rods and any pipework likely to be traversed by an electric current is at least 0.20 m.

When piping feeds underground, the underground runs will be reported on the site plans. Outdoor climbing must be protected against impact by means of a sheath or profile.

For indoor installations servicing an individual residence, running below the residence is authorized, provided that the following two requirements have been met:

- installation is performed with a continuous tubing length of CSST kits;
- all necessary precautions are taken to prevent the risk of shearing.

3. VERTICAL INSTALLATION

(Risers)

Support Intervals:

Must be secured with clips or brackets to prevent sagging.

Recommended support spacing on page 11.

Must not be free-hanging inside wall cavities or risers.

For multistorey buildings:

CSST passing from one floor to another must be:

Fire-stopped at each level (unless in a ventilated fire-rated shaft).

Sleeved appropriately to prevent damage.

Avoid installation where mechanical damage is likely (e.g., in stairwells without protection).

After the installation of CSST pipe and before the prior to pouring screed, the entire run of tubing must be examined visually and manually. The installer must control the cover in order to check whether damage to the coating has taken place as this could prejudice corrosion resistance. If the protective coating of the pliable tubing of the PLT kits is removed or damaged when using the tubing, it shall be fully restored along the entire bare length. This may be carried out for

example using heat-shrinkable sleeves or adhesive strips (non-chlorinated material of a synthetic polymer or elastomer with a total chloride content not exceeding 50ppm). In the event of the baring of the tubing during CSST fitting assembly, the protective strip to be restored shall cover at least the end of the CSST fitting in contact with the tubing.

Paktermo CSST pipes installed on concrete floors must be protected against malfunctions caused by movement. Pipes embedded in concrete floors must be properly shielded and protected against malfunctions due to movement and placement.

The pipes can be protected against deterioration by laying them on the base concrete and then covering them with screed to a minimum depth of 25 mm.

4. HORIZONTAL INSTALLATION

(Runs across ceilings, walls)

Support at regular intervals to avoid drooping:

Recommended support spacing on page 11.

Tubing must maintain clearance from sharp edges, nails, or screws.

Should be run parallel to joists or within service zones.

Do not bend tightly – follow manufacturer's minimum bend radius.

When passing through walls:

Use a sleeve.

Seal the ends of the sleeve (without sealing around the CSST itself).

Tubing must be continuously electrically bonded to meet safety standards.

■ PROHIBITIONS (REMINDER)

Concretes and mortars frequently contain admixtures containing chlorides, iodides or ammoniacal derivatives. Direct incorporation is not a solution to remember given the unpredictable physicochemical reactions.

The pipes must be protected before incorporation by sheathing.

A PVC sheath is suitable for this purpose, for example;

■ Crawl space passages

The gas pipes must not have any mechanical and accessory connections inside a crawlspace.

■ Accessible and ventilated sanitary voids

The passage of a gas piping is authorized provided that it is free from any deposits of combustible materials or materials.

■ Non-ventilated and non-accessible crawl space

The following two conditions must be met simultaneously:

- The length is less than 2 meters
- It is placed under a continuous sheath, one end of which must open:
 - either outdoors or outdoors,
 - either indoors in a ventilated space.

■ Crossing walls (horizontal)

The crossing of the walls comprising a hollow space will be in a sleeve left free at one end or filling the annular space around the pipe with an inert material.

CSST kits can not be used for building penetration during a riser or building control in the custody of the gas distributor.

■ Formwork passage

The pipes can be installed in formwork provided that the formwork does not contain electrical conduits, that access to the pipes remains possible (by disassembling the shuttering cover for example) and that the enclosed volume of the formwork is in communication with a ventilated space.

■ False ceilings

Gas pipes can borrow space between ceiling and false ceiling without the use of ducts, provided that the ceiling has a clean ventilation (communication with a ventilated room, perforated materials ...).

The piping must remain visitable throughout its length. In the opposite case, laying in a continuous waterproof metal jacket opening freely at one end to a ventilated space is mandatory. The use of fittings or mechanical joints in false ceilings is prohibited.

■ Neighborhood with other pipes (aerial)

The gas pipes must not be in contact with other pipes, including the electric pipes. The minimum interval to respect is 30 mm in parallel, and 10 mm in crossing.

■ Neighborhood with antennas or lightning rods

The minimum distance to be respected between the gas pipes and any antenna, broadcasting support or lightning rod descent must be 3m.

■ Pipes incorporated in building components

Embedded piping is understood to mean embedded piping, built-in or embossed piping. Incorporation of post meter piping into structural elements is permitted. The course must be simple and avoid door thresholds. The pipes must not be in contact with other pipes or electrical conduits. When the pipes must pass through voids of hollow elements, the end of the piping must open into the air in ventilated or ventilated volumes.

The use of fittings or mechanical joints in built-in areas is prohibited

■ Laying in elevation

Pipes in elevation located outside the residential building or in outbuildings will be mechanically protected over a height of 2 meters minimum. The piping in elevation of the inner pipes is protected from shocks or liquid runoff. At the emergence of the upper face of a floor, the pipes must be protected by unsplit sheaths made of non-corrodible materials by water and household cleaning products. The annular space between the sheath and the pipework must be closed by an inert material. The emerging part of the sheath will not be less than 50 mm.

In multi-dwelling buildings, the building ducts or any part of the installation outside the dwellings must be placed in a duct or protected by a mechanical protection device allowing ventilation.

■ Fixed Appliances:

PAKTERMO CSST may be connected directly to fixed [non-movable] appliances such as water heaters, furnaces, boilers, and island cook-tops without the installation of a termination outlet or flexible appliance connector, if local code allows. All local codes requiring drig legs and shut-off valves must be observed. When appliances such as water heaters, furnaces, etc. have metallic vents which protrude through the roof physical contact between the CSST and the appliance cabinet are prohibited.

■ Pipes incorporated in structural elements.

Coating of gas pipes in slabs or underfloor heating is prohibited.

In the vertical walls, the minimum coating thickness is 20 mm.

In floors, the minimum covering thickness of the pipes is 20 mm.

Pipe sections incorporated into the shell must not have any mechanical seals

■ Moveable Appliances: Termination Outlets:

PAKTERMO termination outlet eliminates the need for concealed fittings by allowing CSST to be routed to the exterior of a wall or floor to provide a fixed connection point (stub-out). This fixed connection point allows for the attachment of flexible appliance connectors to moveable appliances such as dryers and ranges.

■ Use of moldings

The use of moldings is allowed. The moldings will be compatible with the weight of the pipe to be covered. The size of the moldings is such that it allows the passage of the pipe without damaging it or its coating. The distance between the molding and the other pipes must respect the principles mentioned above (neighborhood with other pipes)

■ PAKTERMO IN DUCTS

When Paktermo CSST is installed in a duct (horizontally or vertically), it must be ventilated

The following applies:

Ventilation in Ducts: If PAKTERMO CSST is installed inside a duct, whether horizontally or vertically, it must be adequately ventilated. This ensures proper air circulation around the CSST, preventing the buildup of potentially hazardous gases.

*Sleeving in Unventilated Voids: When the PAKTERMO CSST passes through an unventilated void, it must be continuously sleeved. Sleeving involves enclosing the CSST within a protective conduit to allow it to safely pass through the duct or void.

*Separation from Metallic Appliances: Under no circumstances should the CSST be installed within a chase or enclosure that contains a metallic appliance such as a vent or chimney liner that protrudes to or past the roof. This restriction helps prevent potential contact or interaction between the CSST and the metallic appliance, ensuring the safety of the gas installation.

*Fire and Smoke Separation: The installation of PAKTERMO CSST must not impair fire or smoke separation within the building. This means that the CSST should be positioned in a way that maintains the intended fire and smoke barriers within the structure. Please check document no EK-1.

Free area of ventilation openings	Cross-sectional area of duct m ²	Min. free area of each opening m ²
	Not exceeding 0.01	0
	0.01 and not exceeding 0.05	Cross sectional area of duct
	0.05 and not exceeding 7.5	0.05
	Exceeding 7.5	1/150 of the cross-sectional area of the duct

Ducts with a small cross-sectional area (less than 0.01 m²) and volume (less than 0.1 m³) are considered to be adequately ventilated by adventitious openings.

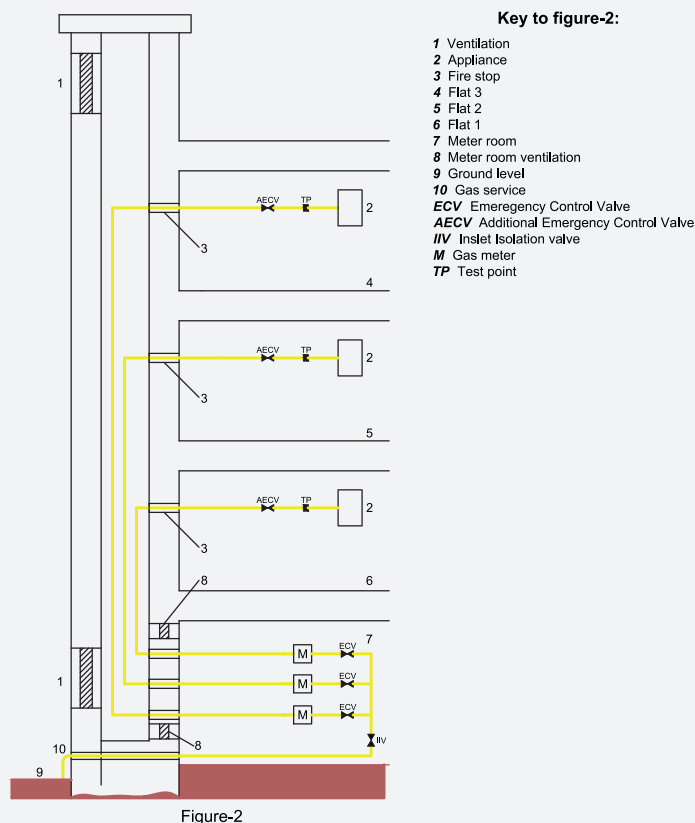
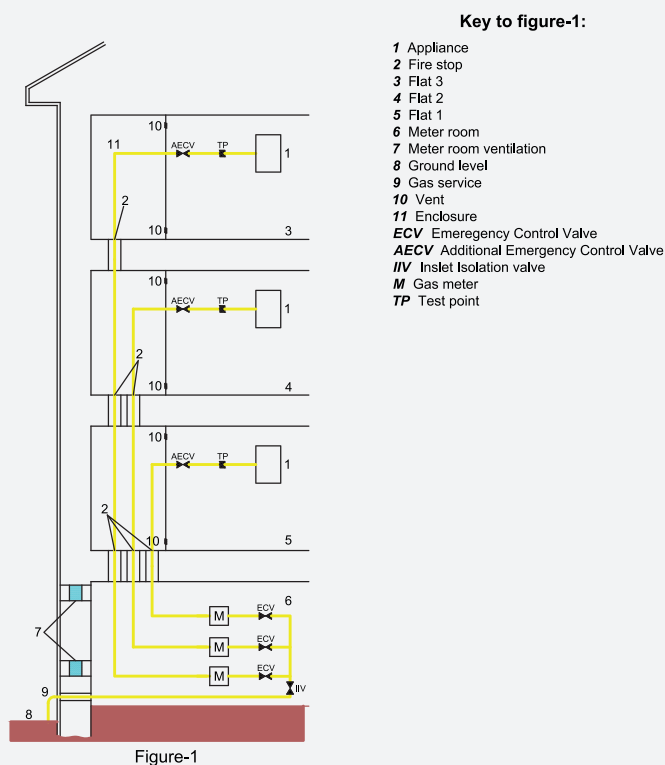
In buildings that contain flats and/or maisonettes, Paktermo CSST installations must be fire-stopped where the tubing passes between floors—unless the tubing is routed through its own fire-protected shaft that is ventilated at both the top and bottom to the outside atmosphere.

Where piping from a continuous duct enters a flat or maisonette, it must be fire-stopped at the point of entry (see below Figure 1 and Figure 2). The fire-stopping material must be tested in accordance with BS 476 and provide fire resistance that aligns with the requirements of the building structure, including load-bearing capacity, integrity, and insulation.

For Paktermo CSST tubing routed through ducts, a minimum fire resistance of 30 minutes is generally required in buildings of no more than three storeys. Paktermo CSST tubing installed within sleeves must not compromise the fire resistance of the structure.

In accordance with applicable installation standards (BS 6891 for domestic installations and IGEM/UP/2 for commercial installations), additional sleeving must be applied when fire-stopping Paktermo CSST Duo tubing. Fire-stopping can then be applied around the additional sleeve.

Paktermo CSST Duo is a continuously sleeved system. In areas where fire-stopping is required, an extra section of sleeve must be added to comply with installation standards and ensure proper fire resistance.



RE-ASSEMBLING A FITTING CORRECTING LEAKS

1. Gradually tighten fitting until leak stops
2. If tightening does not stop after reaching maximum torque of 35 lbs or 50 lbs [refer to maximum torque for each size listed below

STOP and open assembly and check;

- a. To see if they are properly assembled. If not correct, go through assembly steps and test again for leaks.
- b. Check to see that no foreign material is in assembly. If so, clean out and re-assemble and test again for leaks
- c. Check to see that none of the assembly pieces are cracked. If so, replace, re-assemble and test again for leaks.
- d. Ensure use of Pipe tape or Pipe Dope on BSPT Threaded Ends.

How to Disassemble a Paktermo CSST Fitting:

- a. Remove nut
Remove Retainer Ring first, then Slide Ring, then O-ring.
- c. Replace any damaged component.
- d. Re-Assemble per instructions.



PLANING & SIZING

All piping systems introduce pressure loss, the amount of which depends on the piping size and the gas flow (m^3/h). When sizing a system, the installer determines the smallest size piping that will deliver the flow required given the allowable amount of pressure drop. Sizing tables provide the maximum load for a run given the gas pressure, allowable pressure drop, size of pipe and the length of the run. Different sizing tables are used for each combination of system pressure and pressure drop. (Table A.1)

Allowable pressure drop is the maximum pressure loss that can occur and maintain supply pressure for proper equipment or appliance operation. For natural gas, the pressure at the meter outlet should be 21 mbar and the pressure drop between the outlet of the meter and the points to be connected shall not exceed 1 mbar at maximum flow conditions. Low pressure 3rd family gas supplies should be regulated at 28 mbar (butane) or 37 mbar (propane), with a pressure drop not exceeding 2.5 mbar.

Table A.I

	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m	12 m	14 m
DN15	6,05	4,28	3,49	3,03	2,71	2,47	2,29	2,14	2,02	1,91	1,75	1,62
DN20	10,69	7,56	6,17	5,35	4,78	4,36	4,04	3,78	3,56	3,38	3,09	2,86
DN25	18,85	13,33	10,89	9,43	8,43	7,70	7,13	6,67	6,28	5,96	5,44	5,04
DN32	35,69	25,24	20,61	17,85	15,96	14,57	13,49	12,62	11,90	11,29	10,30	9,54
DN40	63,61	44,98	36,73	31,81	28,45	25,97	24,04	22,49	21,20	20,12	18,36	17,00
DN50	113,72	80,41	65,65	56,86	50,85	46,42	42,98	40,20	37,90	35,96	32,83	30,39

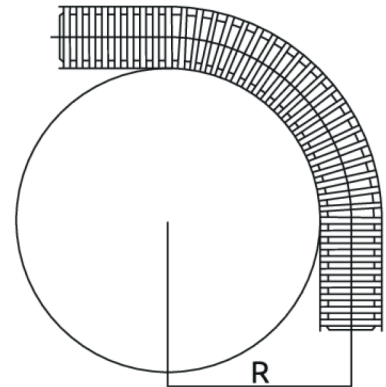
	15 m	16 m	18 m	20 m	22 m	24 m	25 m	26 m	28 m	30 m	32 m	34 m
DN15	1,56	1,51	1,43	1,35	1,29	1,23	1,21	1,19	1,14	1,10	1,07	1,04
DN20	2,76	2,67	2,52	2,39	2,28	2,18	2,14	2,10	2,02	1,95	1,89	1,83
DN25	4,87	4,71	4,44	4,22	4,02	3,85	3,77	3,70	3,56	3,44	3,33	3,23
DN32	9,22	8,92	8,41	7,98	7,61	7,29	7,14	7,00	6,75	6,52	6,31	6,12
DN40	16,42	15,90	14,99	14,22	13,56	12,98	12,72	12,48	12,02	11,61	11,24	10,91
DN50	29,36	28,43	26,80	25,43	24,24	23,21	22,74	22,30	21,49	20,76	20,10	19,50

	35 m	36 m	38 m	40 m	45 m	50 m	60 m	70 m	75 m	80 m	90 m	100 m
DN15	1,02	1,01	0,98	0,96	0,90	0,86	0,78	0,72	0,70	0,68	0,64	0,60
DN20	1,81	1,78	1,73	1,69	1,59	1,51	1,38	1,28	1,23	1,19	1,13	1,07
DN25	3,19	3,14	3,06	2,98	2,81	2,67	2,43	2,25	2,18	2,11	1,99	1,88
DN32	6,03	5,95	5,79	5,64	5,32	5,05	4,61	4,27	4,12	3,99	3,76	3,57
DN40	10,75	10,60	10,32	10,06	9,48	9,00	8,21	7,60	7,34	7,11	6,70	6,36
DN50	19,22	18,95	18,45	17,98	16,95	16,08	14,68	13,59	13,13	12,71	11,99	11,37

Singular losses of charge: For the radii of bending prescribed in the table below ... no particular loss of load is to be taken into account in the calculation of the equivalent lengths.

EQUIVALENT LENGHT – BEND RADIUS

When forming any bends in Brymec CSST systems, an equivalent length calculation should be added to your overall length.



Pipe Size	Recommended Radius	
	R/mm	Equivalent Length/m
DN15	75	0.25
DN20	90	0.25
DN25	125	0.25
DN32	140	0.25
DN40	140	0.25
DN50	150	0.25

Minimum Radius (Tight Bend)	
R/mm	Equivalent Length/m
25	0.5
30	0.5
45	0.5
60	0.5
76	0.5
100	0.5

EQUIVALENT LENGHT – FITTINGS

Brymec CSST Fitting Equivalent Length (eL) - m					
Tube Size	Coupling	M/F Threaded	Tee		
			Cross Flow	Branch Outlet	Branch Supply
DN15	0.0m	0.0m	0.0m	0.5m	0.5m
DN20	0.0m	0.0m	0.0m	0.5m	0.5m
DN25	0.0m	0.0m	0.0m	0.5m	0.5m
DN32	0.0m	0.0m	0.0m	0.5m	0.5m
DN40	0.0m	0.0m	0.0m	0.5m	0.5m
DN50	0.0m	0.0m	0.0m	0.5m	0.5m

Where a reduced branch tee is to be used, the equivalent length of the smaller branch shall be used for the equivalent length calculation.

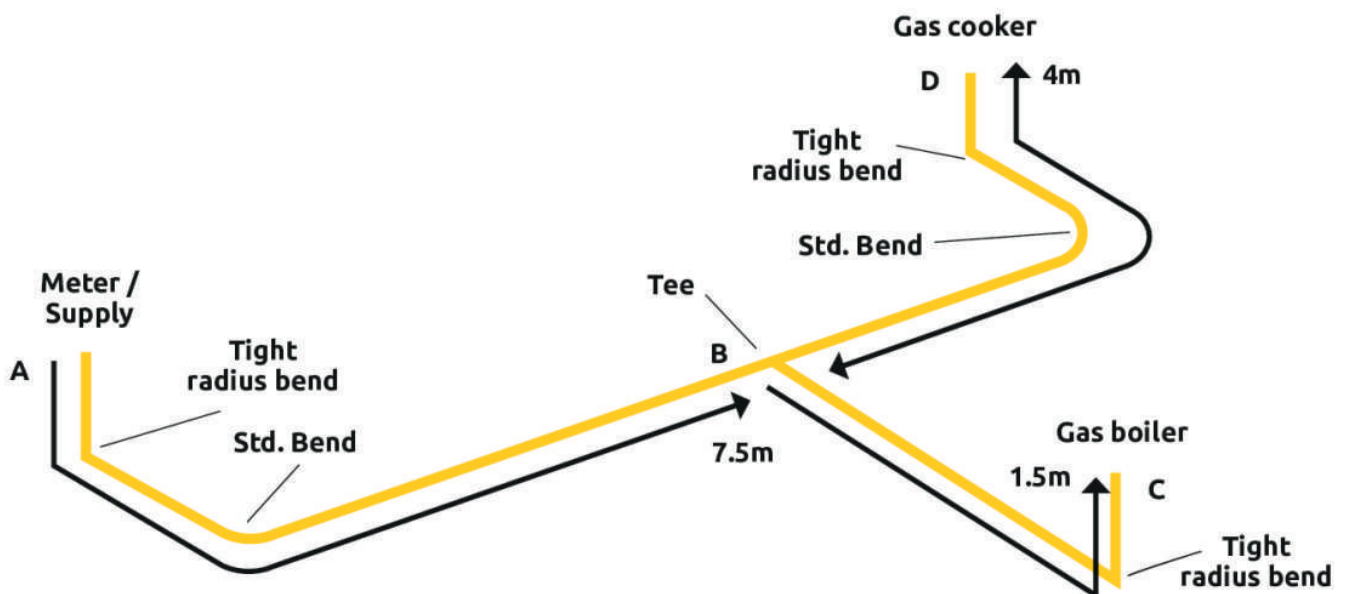
PIPE SIZING EXAMPLE

For the calculation of the necessary pipe size for the supply of natural gas (LPG gasses require different tables), the below method of calculation should be applied.

Design standards recommend that a maximum pressure drop of 1mbar is to be applied to calculate the pipe size between the meter and each individual service or outlet.

Each length of pipe should be calculated in turn, making allowances for the pipe losses, and for additional losses through any fittings, or any formed bends. Differentials in the height of the meter/supply and the height of the service must also be catered for in the calculation.

Where the required flow rate from table A1 on page 21 does not match the calculated volume required, the next highest value must be selected from the table – i.e. increase pipe diameter to the next available size.



Pipe run	Services	Gas flow rate	Pipe length (a)	Equivalent length		Total length (a+b)	Tube diameter (DN)
	Services			Fittings / Bends	Equivalent length (b)		
A - B	Gas Boiler + Gas Cooker	3.6 m ³ /h	7.5m	1 tight radius bend + 1 std. bend	0.75m	8.25m	DN25
B - C	Gas Boiler	2.4 m ³ /h	1.5m	1 tee + 1 tight radius bend	0.75m	2.25m	DN15
B - D	Gas Cooker	1.2 m ³ /h	4m	1 tee + 1 bend + 1 tight radius bend	0.75m	4.75m	DN15

Gas pipe sizes are best calculated allowing for the maximum load that is likely to be applied, including a provision for any later additions to the pipe scheme, and for the largest reasonable appliance that is likely to be connected.

PIPE TEST

The gas installations put in place by the installer are subject to testing and verification by the installer. In the case of pipes with sheaths or recessed pipes, as the verification can only be carried out on exposed pipes, all lengths of PAKTERMO pipe are tested at the factory at a pressure of 2 bar air / helium.

The junctions between the sections tested separately before installation remain alone apparent during the test. When the installer must dispose of the gas to carry out the tests, it is his responsibility to make any agreement with the distributor to obtain from it the provision of the means of supply and then to interrupt this supply until the setting service of the installation. In the case of liquefied hydrocarbons, the installer will, if necessary, take the same measures.

The installation of the heat-shrink sleeves is only carried out after the leak test if it meets the criteria of the standard or local regulations.

Nature of gas distribute	Test Pressure	Type of Manometer	Gas Used for Test	Satabilization Time	Duration of the Tes
Leakage Test					
Naturel Gas	> 400m bar or distribution pressure	Metalic 600m bar	air or gas distributed	15 min	10 min
Gas distributed in a network or liquefied hydrocarbons distributed per container	> 400m bar or distribution pressure	Metalic 600m bar	air, nitrogen, butane propane or gas distributed	15 min	10 min

STORAGE CONDITIONS

The PAKTERMO and PAKTERMO DUO CSST kit components should be stored as far as possible in their original packaging. Storage on site must be organized in such a way as to protect the products from rain, sun, dust and various projections.

Any foldable hose crown that has been opened must be stored with its ends sealed by the plastic caps available in the PAKTERMO range.

To avoid condensation, it is recommended to store the collapsible tubes inside the room that must receive the installation a few hours to the screen to establish a thermal equilibrium.

The crowns must be free from any mechanical damage (local crush, damaged sheath, etc.) that may reduce their performance.

PAKTERMO corrugated hose kits can be incorporated into building materials as long as they are placed in sleeves. Mechanical connections are prohibited in the built-in sections.

DAMAGES & REPAIRS

Following the installation of a Brymec CSST or CSST Duo system, the whole length of pipe work must be inspected for damage, and to confirm that no sections of stainless-steel tube are exposed. Any exposed stainless-steel tube must be protected from the environment using the correct Brymec Self-amalgamating tape.

Damages and repairs can be split into 3 categories:

- > Abrasions, tears or punctures to the Inner protective sleeve
- > Abrasion, tears or punctures to the outer Duo Integral Containment Sleeve
- > Mechanical damages resulting in a deformation of the pliable corrugated stainless-steel tube

INNER POLYETHYLENE SLEEVE

CSST and CSST Duo stainless-steel pipe systems are both protected from corrosion and the effects of environmental degradation by a durable Polyethylene cover. Any exposure of the stainless-steel pipe could lead to corrosion and failure of the assembly.

Any damage to the Polyethylene cover must be repaired using the Brymec Self-amalgamating tape.

First of all, please ensure that any damage to the protective Polyethylene sleeve has had no detrimental effect on the actual stainless-steel tube itself. If the stainless-steel tube has been damaged, please refer to the details under 8.2 'Mechanical damages to the stainless-steel tube'.

Starting a minimum of 50mm from the point of the damaged area, wrap the self amalgamating tape around the tube and along the damaged area, making sure that the tape overlaps the previous wrap by 50% of the tape's width.

DUO – INTEGRAL CONTAINMENT SLEEVE

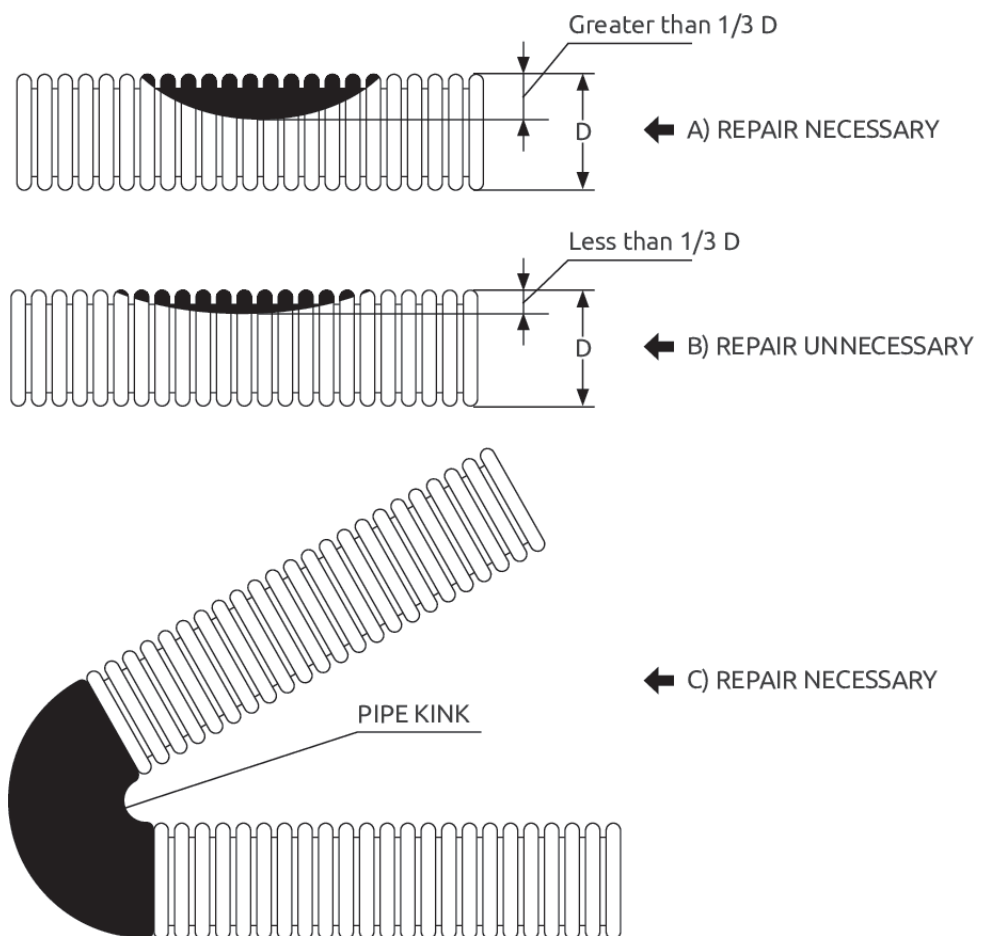
The integral Containment Sleeve of the CSST Duo system is intended as a safety containment for any release of gas through an unventilated space. If damage of any kind is witnessed to this layer, please refer to Brymec for advice on the necessary corrective actions.

STAINLESS TUBE – MECHANICAL DAMAGE

The stainless-steel tube is highly resistant to many forms of damage. However, in some cases it may be necessary to take corrective measures and replace the whole length of damaged tube.

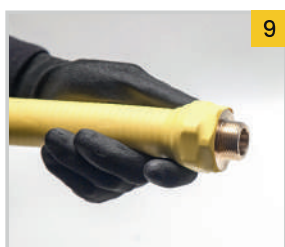
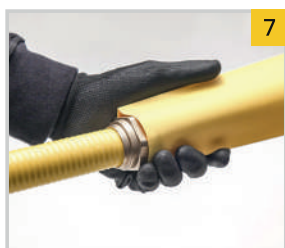
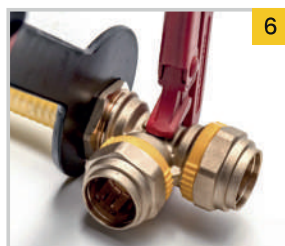
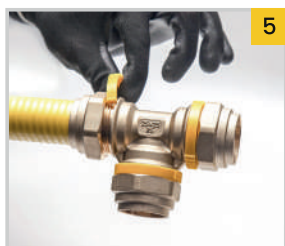
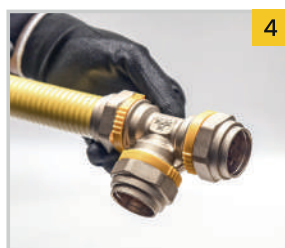
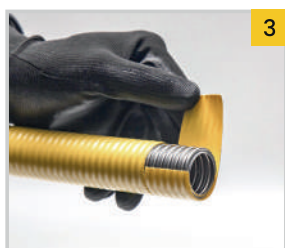
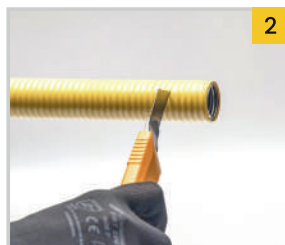
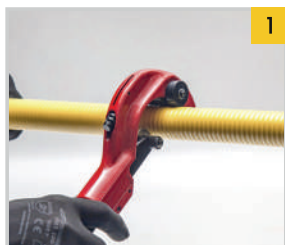
Any damage that has punctured the stainless-steel tube, or which has caused an abrasion or dent to the surface which could compromise the performance of the tube, will need to have the length of pipe replaced.

For the standard CSST, please use the below conditions to determine if a repair/replacement is necessary:



If there is any substantial damage or deformation to a Brymec CSST Duo pipe length, then the whole pipe length MUST be replaced. The Duo system must NOT have a joining section added to the pipe length. The outer Integral Containment Sleeve must have no interruptions between the two ends which must be terminating in a ventilated area.

INSTALLATION INSTRUCTIONS OF PAKTERMO CSST



1- Cut tubing at required length with a tubing cutter between two corrugations. Tighten roller pressure slightly after each revolution. If the end of the tube is not smooth and there are burrs please cut tubing again.

2- Cut yellow cover at 6th Corrugation for on 15, DN20, DN25 and DN32, 5th Corrugation for DN40 and DN50 from the tubing end with a utility knife. Please pay attention to the number of corrugations.

3- Please carefully peel off the yellow cover.

4- Insert the tube into the fittings firmly until not seeing metal part of the tube.

5- Remove yellow ring between nut and fittings.

6- Firstly tighten the nut by hand when the tube is inserted into the fittings. Later tighten the nut with a wrench. When tightening the nut tubing should be kept fixed. The nuts are tightened until in abutment but not exceeding the torque values in the table.

7- Cut the heat shrink tube to the length of cover the fittings and pipe connection area. After the assembly of end connection, put the heat shrink tube.

8- Then use hot air gun to shrink the tube over the pipe and fittings.

9- Cut and clean the heat shrink parts that come towards the throat of fittings with the utility knife.

INSTALLATION INSTRUCTION OF PAKTERMO DUO



D1. Cut tubing at required length with a tubing cutter between two corrugations. Tighten roller pressure slightly after each revolution. If the end of the tube is not smooth and there are burrs please cut tubing again.

D2. Position the hose peeler onto the tube, making sure it's around 80 mm away from the cut end. Rotate it at least three times to slice through the outer layer while leaving the inner covering unharmed.

D3. Remove the cutter part outer sleeve by twisting and pulling it off the pipe from the cut end while firmly holding the other end with your other hand.

D4. Cut inner cover at **6th** Corrugation for **DN 15, DN 20, DN 25** and **DN 32**, **5th** Corrugation for **DN 40** and **DN 50** from the tubing end with a utility knife or with a hose peeler. Please pay attention to the number of corrugation.

D5. Insert the tube into the fittings firmly until not seeing metal part of the tube.

Note: The rest steps are same as with PAKTERMO CSST installation.

INSTALLATION PAKTERMU DUO WITHIN UNVATILATED VOIDS

When utilizing PAKTERMO semi-rigid gas piping in unventilated voids, it is essential to adhere to the following guidelines:

Sleeve Requirement: PAKTERMO DUO must be sleeved when passing through walls or floors. At the meter box, it should pass through the provided sleeve/spigot, ensuring proper sealing within the meter box.

Inspection Visibility: The entire length of PAKTERMO DUO should remain visible during installation to allow for visual inspection of the outer cover. Any damage should be promptly repaired before enclosing the pipework.

Outer Cover Damage Repair: If the PAKTERMO DUO outer cover is compromised, impacting its function as a sleeve (e.g., full penetration), utilize silicone tape or heat shrink band to repair the damage.

Avoid Joining in Unventilated Spaces: Unless the unventilated space meets requirements for nil ventilation in terms of cross-sectional area and volume, and the fittings remain accessible, refrain from joining or teeing PAKTERMO DUO in such spaces.

Continuous Lengths in Protected Shafts: When routing PAKTERMO DUO within a protected shaft containing a stairway, lift, or other fire escape route, only use continuous lengths without joints.

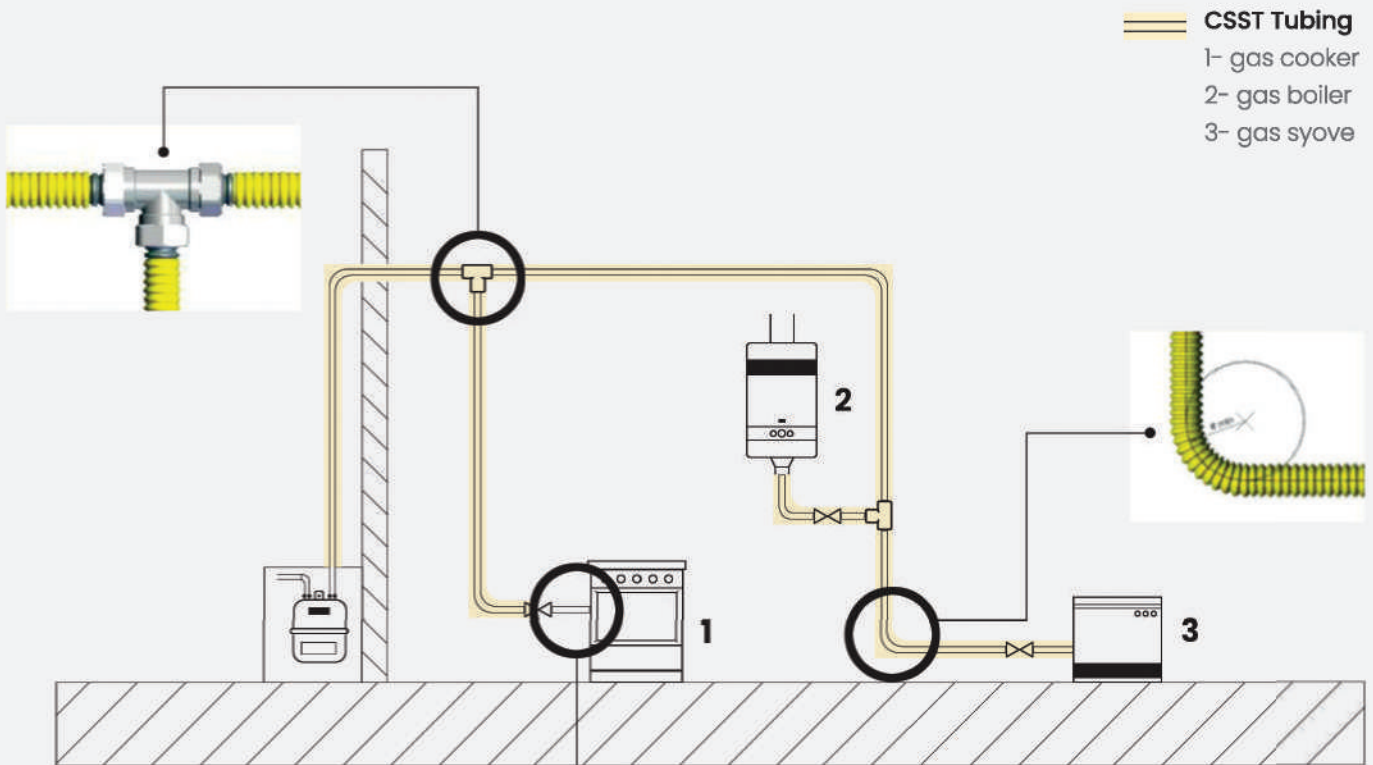
To ensure proper documentation, it is advisable to maintain a permanent record confirming that the PAKTERMO DUO installation adheres to the current PAKTERMO DUO Design and Installation Specification. This record will inform future inspectors that additional ventilation is unnecessary for the void through which PAKTERMO DUO is routed. Remember to consult Building Control and, if applicable, the Home Warranty provider to determine their preferred installation methods for PAKTERMO.



BS EN 15266 (CSST)
GAS INSTALLATION
SYSTEM IN BUILDINGS

- EASY INSTALLATION
- SAFE
- TIME SAVING

■ INSTALLATION INSTRUCTION OF CSST PIPE 2



■ Connection To Movable Gas Equipments

For the connection to movable gas equipments only flexible metallic or non-metallic hoses can be used (see the national gas normative for possible limitations on the maximum lengths of the pipes and / or Powers of the equipments).

■ Connection To Fixed Or Encased Gas Equipments

As the steel (EN 10255) and copper (EN 1057) rigid pipes, also the pliable corrugated CSST tubes conform to EN 15266 standard can be used for the direct connection to gas equipments provided that the tube length not sustained with clamps is not more than 500 mm long.

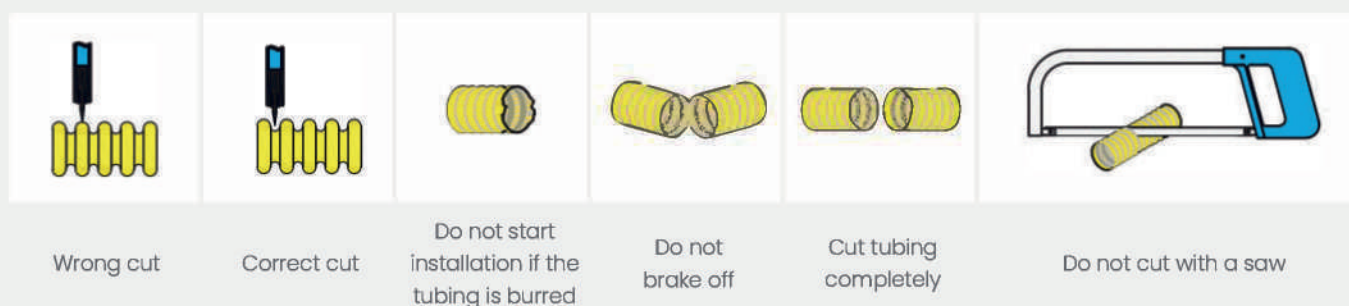
The plant must be "artfully" installed and tested in compliance with current legislation and/or technical rules applicable in the country of use and only by fully trained, experienced and qualified installers.

WARNINGS

Avoid Following Situations

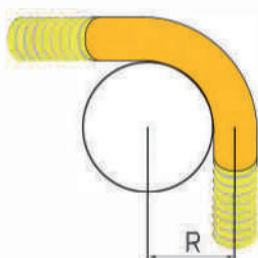


Installation Warnings (Use only tube cutter while cutting)

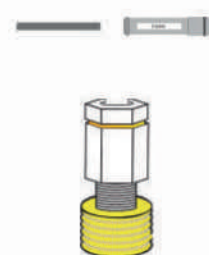


**PLEASE DEFINITELY DO NOT USE OTHER BRAND PRODUCTS WITH
PAKTERMO GAS INSTALLATION TUBING AND PARTS.**

Tube Diamenter	Minimum Bending Radius(mm)
DN	R
DN 15	25
DN 20	30
DN 25	45
DN 32	60
DN 40	76
DN 50	100



Tube Diamenter	EN15266 CSST Assembly Torque Values (N.m)	
DN	MIN.	MAX.
15	65	95
20	90	130
25	105	150
32	125	170
40	240	300
50	320	370



Bending Radius Table of Paktermo CSST and Paktermo DUO

Please pay attention to do same bending Radius in order to reduce pressure loss. Do not bend and unbend the tubing many times. Please use above table for bending Radius values.

Smaller bending Radius increase the pressure loss.

Please strictly follow the values in above table.

Maximum Tightening Torque Table

Remove yellow ring between nut and fittings.

Firstly tighten the nut by hand when tube tubing is inserted into the fittings.

Later tighten the nut whit a wrench according to above tightening torque table.





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