



PhoNoFire®

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PhoNoFire® is the new drainage system from Coes that resolves the problem of noise. Its outstanding resistance to flames means that it also limits the spread of fire throughout buildings.

The outstanding characteristics of the raw material and Coes' know-how give PhoNoFire® the following properties:

- Outstanding resistance to the spread of fire. PhoNoFire® has achieved the **B classification according to EN 13501-1: 2002.**
- Outstanding sound absorption of drainage noise
- Outstanding chemical resistance to the transport of liquids
- Perfect hydraulic seal, guaranteed by the “double-lip” gasket seal, even under back-flow conditions
- Recyclability. PhoNoFire is manufactured from **100% recyclable materials**

PhoNoFire® is available in diameters from 58 to 200 mm. with special and exclusive elements such as the swept-entry branch. The programme is composed of the multi-layer pipe and the self-extinguishing PP co-polymer fittings plus mineral fibres. The fittings feature a very innovative design.

The technological innovation of PhoNoFire® is represented by 3 European patents:

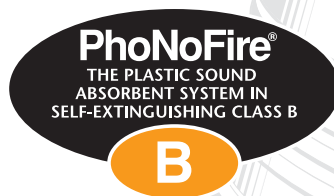
- Industrial design of the fittings
- Raw material and compound of the 3 pipe layers
- “Double-lip” gasket connection system

The dimensions of PhoNoFire® pipes and fittings comply with the UNI EN 1451-1 standard.



INNOVATION AND PATENTS

- EXCELLENT FIRE RESISTANCE
- EXCELLENT SOUND ABSORPTION
- “DOUBLE-LIP” GASKET CONNECTION SYSTEM
- UNIQUE AND INNOVATIVE DESIGN OF THE FITTINGS
- NUMBER OF SYSTEM PATENTS
- WIDE PRODUCT RANGE



PHONOFIRE® IS 100% RECYCLABLE

TECHNOLOGICAL INNOVATION

PhoNoFire® has obtained 3 international patents:

- ORNAMENTAL, FOR THE INDUSTRIAL DESIGN OF THE FITTINGS

DESIGN PLUS 2005
AWARD

- FOR THE RAW MATERIAL AND PIPE COMPOUND
- THE GASKET CONNECTION SYSTEM ON THE RING WHICH IS MECHANICALLY INSERTED INTO THE FITTING





No Fire

FIRE RESISTANCE

PhoNoFire® THE REAL PLASTIC ALTERNATIVE TO CAST IRON

Nowadays, the problem of fires in public and private buildings is an extremely important issue.

To prevent the start and spread of fires, Italian and European standards require a series of active prevention measures, with the installation of detectors, alarms, sprinklers, etc.; and passive (or preventive) protection in building design, by selecting materials whose intrinsic characteristics limit the fuelling and spread of the fire.

PhoNoFire® is a plant engineering solution which limits the spread of fire through the drain system. A study on the raw material, in collaboration with the most important European research institutes, has achieved a special compound which makes the system highly resistant to fire.

PhoNoFire® has achieved the **B - S3, do** classification according to the EN 13501-1:2002 European standard.



Numerous tests have been carried out at the LAPI (Fire Prevention Laboratory) in Prato - Italy in order to test the fire resistance of PhoNoFire®.

FIRE RESISTANCE TEST: CONDITIONS

The test method refers to the EN 13823: 2002 standard “Tests of reaction to fire of building products - “building products exposed to thermal attack by a single ignition source”.

- The pipe, with a diameter of 110 mm, was installed on fireproof support slabs made of calcium silicate, with a nominal density of 900 Kg/m³ and mounted according to the PrEN 15012:2004 standard.
- The test also includes a lateral branch with a diameter of 58 mm.
- The pipe and branch are attached with by metal collars.
- The system was conditioned at constant mass according to UNI EN 13238.
- Application of the flame, the recording of data and visual observations were carried out as required by EN 13823.

Dimensions in mm

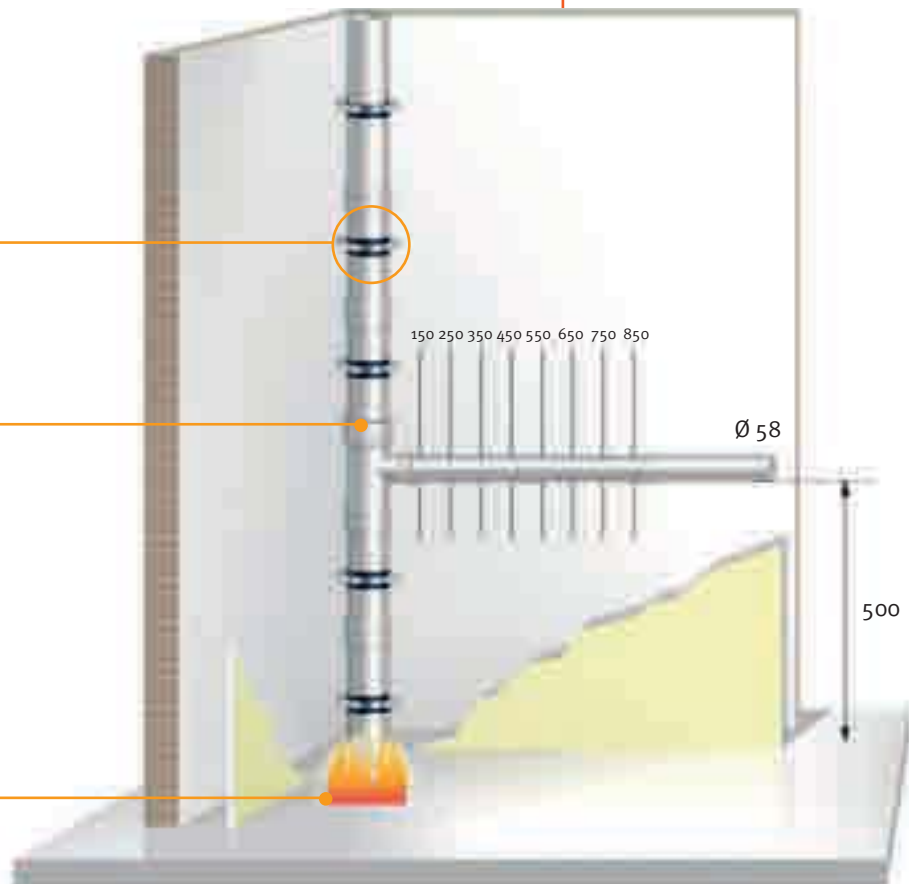
113

Assembly and attachment of test system according to EN 13823

Metal attachment
collars

PhoNoFire® plant

Open-flame ignition
source



SELF-EXTINGUISHING CERTIFICATE



Sono stati sottoposti a prova 3 provini, in quanto a seguito delle prove, i valori medi di FIGRA, THR_{500-L}, SMOGRA, TSP_{500-L} calcolati su tali provini e i risultati di Fs, LFS e gocciolamento permettono di ottenere la classificazione attesa dal Richiedente (vedi EN 13501-1 paragrafo 7).
 (-): non applicabile.
 Three specimens have been tested, as the test yield mean values of FIGRA, THR_{500-L}, SMOGRA, TSP_{500-L} and Fs, LFS and dripping results which allow to obtain the classification envisaged by the Sponsor (see EN 13501-1 clause 7).
 (-): not applicable.

4. CLASSIFICAZIONE E CAMPO DIRETTO DI APPLICAZIONE
Classification and direct field of application

4.1 Riferimenti e campo diretto di applicazione
Reference and direct field of application

La presente classificazione è stata effettuata in accordo al punto 10 di EN 13501-1:2002.
 This classification has been carried out in accordance with clause 10 of EN 13501-1:2002.

4.2 Classificazione
Classification

Il prodotto "PHONO FIRE" in relazione al suo comportamento al fuoco è classificato come
 The product "PHONO FIRE" in relation to its fire behaviour is classified as

B - s3, d0

4.3 Campo di applicazione
Field of application

La presente classificazione è valida per la seguente condizione di uso effettivo:

"Sistema di tubazione in materiale plastico da impiegarsi per scarichi igienici e di rifiuti liquidi all'interno delle strutture di una costruzione."

secondo prEN 15012:2004.

This classification is valid for the following end use condition:

"Plastic piping system for soil and waste systems within the building structure"

according to prEN 15012:2004.

Rapporto di classificazione Classification Report no. 1092 50C0050/05	Nome / Name Dr. Gian Enrico	Firma per conto di Signature on behalf of L.A.P.I. Srl	Data / Date 21/11/2005	4 / 5
Preparato da: Prepared by:	Dr. Gian Enrico			
Verificato da: Checked by:	Dr. Gian Enrico			

PhoNoFire® is the first drainage system to have obtained the highest fire-resistance classification for plastics.



The **B - S₃, d0** classification gives the following:

- B:** Fire behaviour index:
low contribution to the spread of fire
- S₃:** Smoke production index:
average level of smoke production
- d0:** Burning droplets index:
absence of burning particles

FLAME-RESISTANT ACCESSORIES

The **fire-resistant sleeve** is an essential accessory in preventing the spread of fire and smoke. Due to its characteristics and based on the type of drain system, it guarantees protection classified as REI 120 or REI 180. This means that even under the action of fire, the material from which the collar is made preserves its mechanical properties, preventing flames and gases from propagating for a period of 120 or 180 minutes.



REI 120 wall



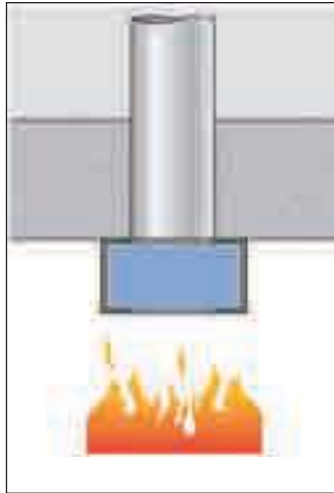
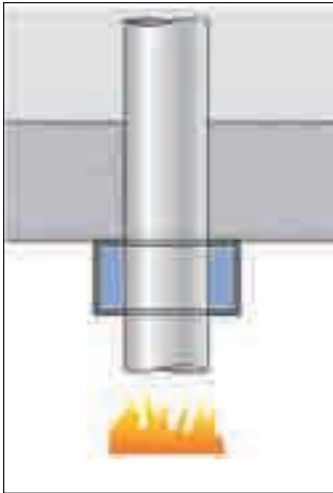
REI 180 wall



REI 180 floor

The sleeve consists of a metal bracket that acts as a "container" for a ring made of heat-expansive intumescent material which is sensitive to high temperatures.

As the fire develops, the sleeve ring expands, closing the pipe passage and insulating the connection between rooms.



Operation of the fire-resistant sleeve



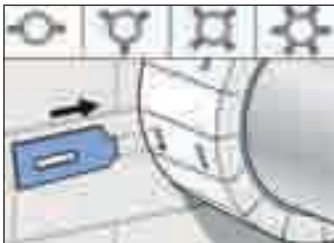
1 - Seal the fissures around the pipe with mortar.



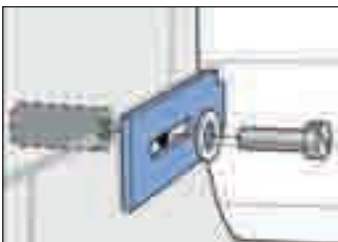
2 - Clean the pipe before applying the fire resistant sleeve.



3 - Fasten the sleeve onto the pipe.



4 - Fasten the hooks in the relevant holes around the fire barrier sleeve.



5 - Use metal anchor plugs to fasten the sleeve.

Installation of the fire-resistant sleeve

SOUND ABSORBENCY



NOISE

Noise is an elastic longitudinal wave. In order to spread, it requires a source, a vibrating body, and an elastic medium. The wave phenomenon of noise stimulates the sense of hearing.

A sound wave is a succession of rarefactions and compressions of small portions of air; each individual molecule transfers energy to the adjacent molecule and, then, after the passage of the wave, returns more or less to its original position. The transitions from rarefaction to compression vary in frequency, intensity and duration, so that each noise can be described by considering these 3 characteristics. The units of measurement of frequency, intensity and duration are, respectively: Hertz (HZ), Decibels (dB), seconds or milliseconds (sec. or msec.).

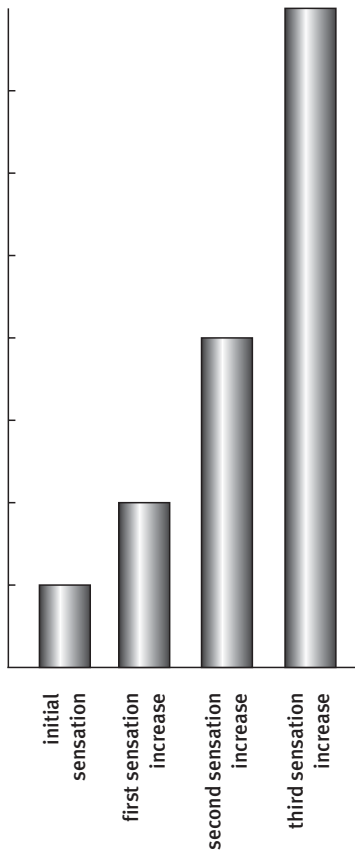
The human ear perceives frequencies ranging from 20 Hz to 20 kHz, and is most sensitive between 2 and 4 kHz. The range of the human voice varies from 500 Hz to 2 kHz.

An increase in the sound level produces a different effect on the human ear. Starting from a very low sound level, at first an additional unit of sound seems to make a great difference to the sense of hearing. However, subsequent additions of the same unit of sound become progressively less effective and, finally, there comes a point where the ear detects no increase in sensation even though the physical measurement of the intensity of the sound reveals an increase in power.

The behaviour of the human ear can be defined by saying that the changes in sensation are proportional to the ratios of acoustic power.

In practice, an increase - measured by instruments - from 1 mW to 2 mW is perceived by the ear as a doubling of the sound intensity; however, to achieve another equivalent increase in the perception of sound, an increase from 2 mW to 4 mW is necessary, and then from 4 mW to 8 mW.

By convention, we use decibels (dB) to describe the behaviour of the human ear in quantitative terms. The increase of a given number of decibels generally indicates the same increase in sensation, regardless of the initial intensity taken as reference. A change of 3 dB corresponds to a doubling of the auditory sensation. This variation is generally considered to be the first noticeable variation.



Sound does not propagate in a vacuum, but only in the presence of material, whether solid, liquid or gaseous.

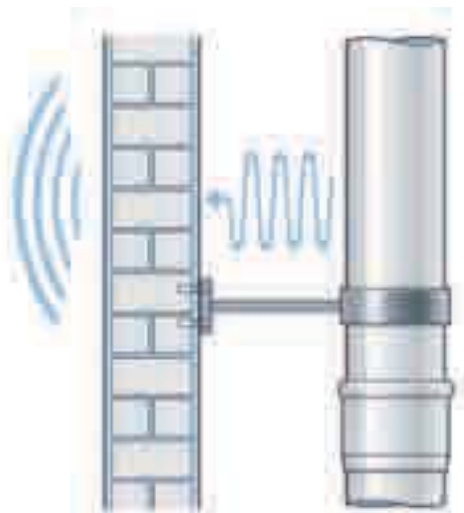
Inside a building, the propagation of sound can occur by air or by vibration.

Sound by air spreads through indirect vibrations, from the pipe to the room, through the air. In this case, the quality of the material plays a fundamental role and it must have those characteristics of stability, strength and sound absorbency that determine the system's strong points.



Sound propagation by air

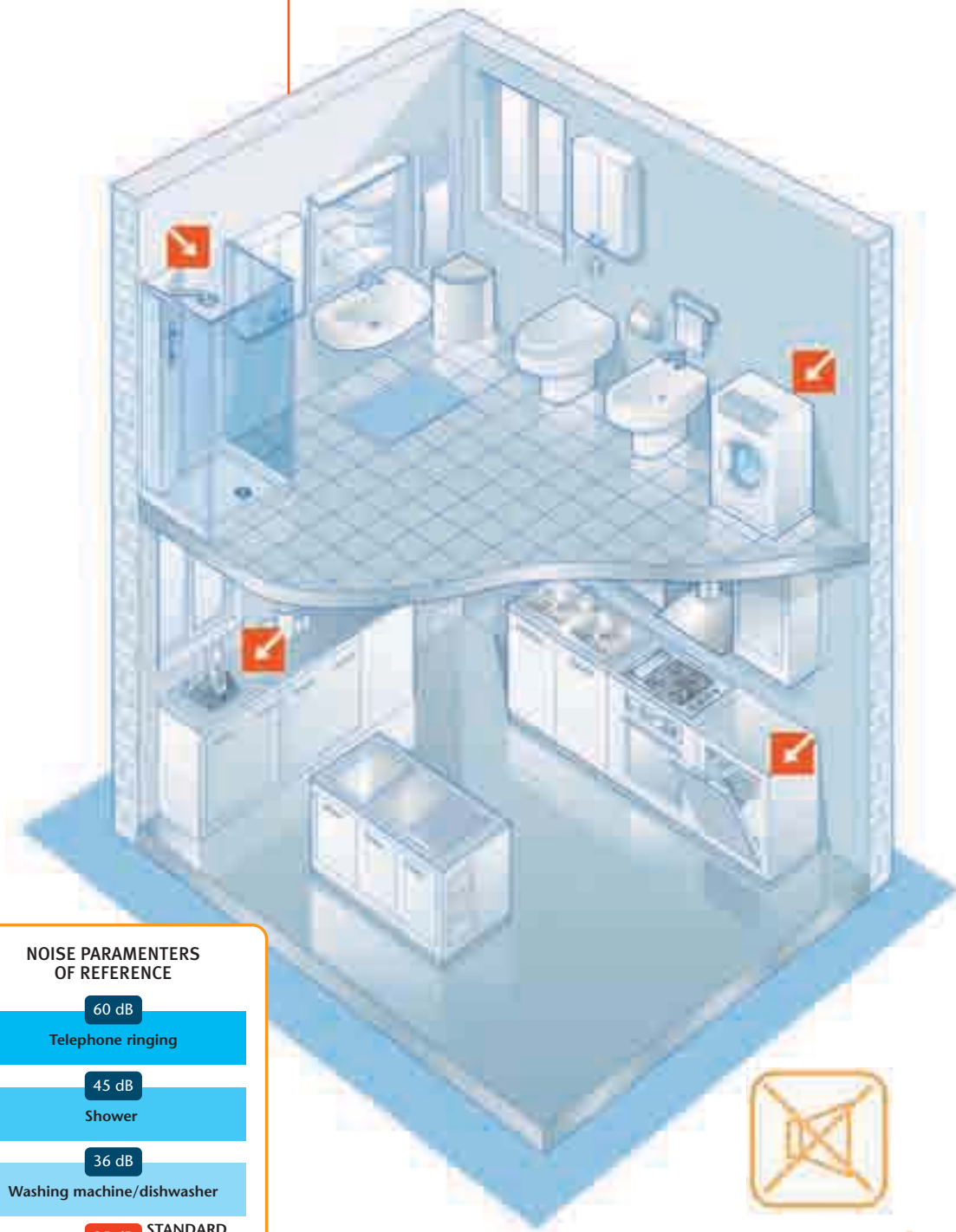
By vibration the sound is generated by the vibration developed by the flow of water inside the pipes, and the attachments are its means of propagation. This creates a direct bridge between the pipe and the room. Sound by vibration must be intercepted at the attachment points with special collars, equipped with a special gasket to guarantee acoustic insulation.



Sound propagation by vibration

PLUSES OF THE SYSTEM

Inside a building, sanitary fittings and their underlying drain systems are one of the greatest sources of noise. The vibrations produced by these systems and the water that flows into them, are transmitted to the walls and, then to the external environments, causing annoying noise.



120

NOISE PARAMETERS OF REFERENCE

60 dB	Telephone ringing
45 dB	Shower
36 dB	Washing machine/dishwasher
35 dB	STANDARD
Maximum noise levels for drainage systems permitted in Italy for certification	

To measure the sound-absorbency of the PhoNoFire® system, specific phonometric tests were performed that revealed noise levels at the minimums required by standards.

✓ Possible sources of noise inside an apartment

No Phono



REFERENCE STANDARDS

Certain standards define the minimum acoustic insulation requirements needed to protect people from noise disturbance.

- a) DIN 4109 concerning sound insulation in buildings
- b) The directive VDI 4100
- c) The PMD of 05.12.97 which establishes noise pollution criteria in Italy

DIN 4109 establishes the maximum noise level, expressed in decibels, which can be produced by a water and drainage system. This measure is 30 dB(A).

The directive **VDI 4100** defines 2 sound insulation levels, distinguishing between apartment blocks, semi-detached houses and terraced houses, and detached homes

The noise limits in the first case are 25 dB and 20 dB in the second case.

Italian law defines the “passive acoustic requirements of buildings” limited to new systems, establishing the noise requirements of external sources as well as those of the building constructions (floors, façades...).

The living environments affected by the application of the decree are classified into 7 categories:

- category A: residential buildings and similar;
- category B: office buildings and similar;
- category C: buildings used as hotels, guest houses and similar businesses;
- category D: hospitals, outpatient clinics, nursing home buildings and similar;
- category E: school buildings (of all levels) and similar;
- category F: recreational or religious buildings and similar;
- category G: buildings used for commercial activities and similar.

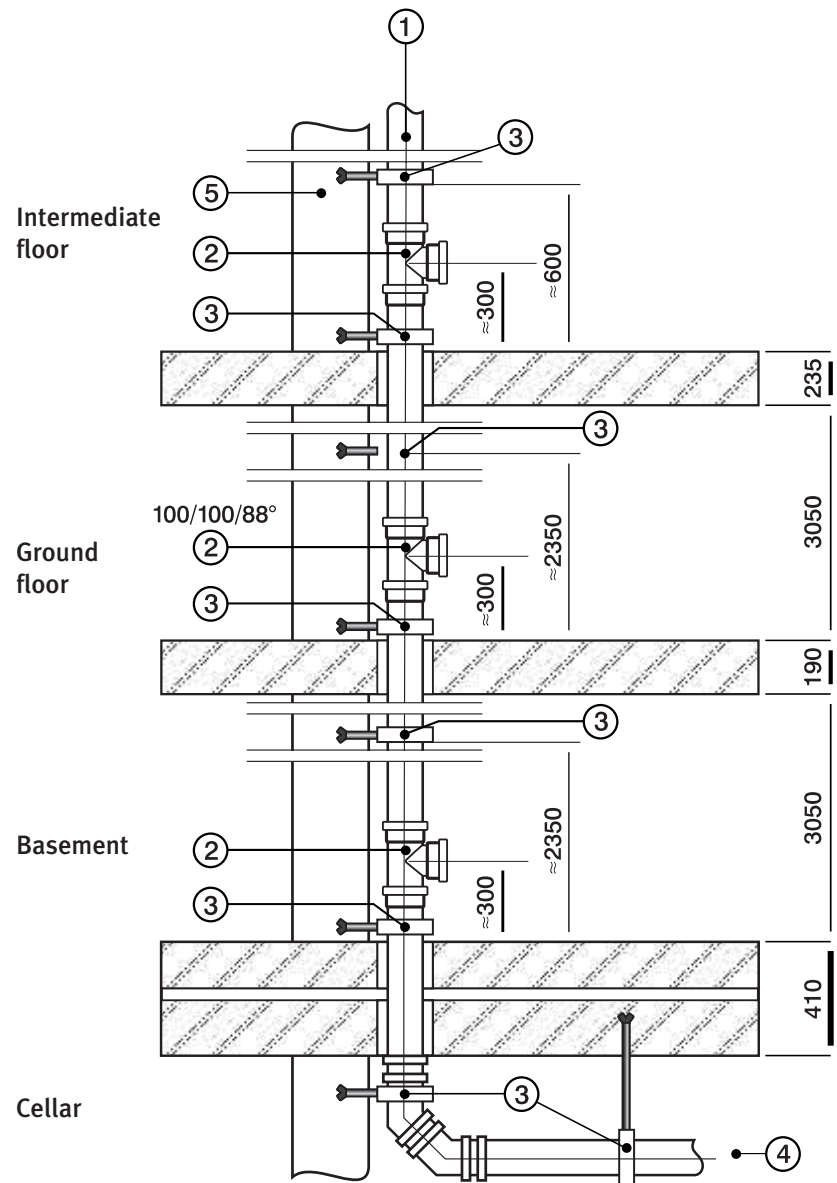
The decree states that the permitted limits for noise produced by systems are:

- 35 dB(A) for services with discontinuous operation (lifts, plumbing drains and taps)
- 25 dB(A) for systems with continuous operation (heating and air conditioning, ventilation)

SOUND-ABSORPTION TEST: CONDITIONS

Sound insulation tests were carried out at the Institute of Building Physics “Fraunhofer” in Stuttgart, in compliance with the building scheme of DIN 4109. The pipe was tested from a phono-technical point of view in a standard building, based on various drainage volumes. The plant diagram subjected to testing is shown in figure 1.

Plant scheme



- ① Drain pipe
- ② 87° branch
- ③ Collars for wall attachment
- ④ Drain
- ⑤ Concrete partition wall

Characteristics of the test system

- ① PhoNoFire® is installed on a concrete wall with a mass equal to 220 Kg/sq. m.
- ② The diameter of the pipes and fittings used is 110 mm.
- ③ The pipe stretches from the mezzanine floor to the cellar via the ground floor. The connections are installed in the basement.
- ④ The drain pipe is fixed to the wall with soundproofing collars.
- ⑤ The system is sized with a flow volume of 1.0 2.0 and 4.0 l/s (4.0 l/s corresponds to the flow volume of a condominium with 12/13 apartments).

The results achieved (and certified) are shown in the table below:

Measurements by the Institute of Building Physics "Fraunhofer" in Stuttgart - Germany		PhoNoFire® drainage system (manufactured by Coes) with fastening collars "Mupro 110, 108-112"			
		Flow rate [l/s]			
		0,5	1	2	4
Acoustic level dB(A)	Sound level L_{in} [dB(A)] measured at the base of the system	43	47	50	52
	Sound level L_{in} [dB(A)] measured at the base of the system, behind a wall with a mass equal to 220 Kg/sqm ⁽¹⁾	11	17	22	27
	Sound level L_{in} [dB(A)] measured at the base of the system, behind a wall with a mass equal to 220 Kg/sqm, without fastening collars	2	3	8	15

(1) Measurement according to DIN 4109



FIXING SYSTEM

Special **collars for pipe attachment** must be used to obtain optimal sound-absorption of the PhoNoFire® system.



Figure 2. - Example of a fixing collar installation

The main characteristics are the following:

- The collar is made of two parts
- The two fixing screws enable correct installation even with pipes of different tolerances.
- **The blue sound-proofing gasket DÄMMGULAST® complies with fire-resistance B1 class, according to the DIN 41.02 standard (no burning droplets in the presence of flame).**
- **Phonometric tests showed average sound insulation of 16,5 dB(A).**
- By removing the spacers, the collar can be used as a fixed anchor point.

TECHNICAL SPECIFICATIONS

PRODUCT RANGE

From DN 58 mm to DN 200 mm.

The programme is equipped with special and exclusive elements, such as the swept-entry branch, diameters 110/90 and 110/110 mm.



SELF-EXTINGUISHING CLASS

PhoNoFire® is classified **B - S₃, d0** in compliance with the EN 13501-1 standard: 2002

COLOUR

White RAL 9018. The internal layer is white

PIPE MARKING AND NOMENCLATURE

Coes, PhoNoFire®, Multilayer Pipe, DN x thickness, Certificates, DIN or reference standards, self-extinguishing class, batch, date of manufacture, bar code.



E.g.: Coes - PhoNoFire® - Multilayer Pipe,
110x4,8mm. - DWGV - no. 100 - 20/01/2005

CHEMICAL RESISTANCE

PhoNoFire® guarantees great resistance to a very large number of chemical agents, particularly surfactants, even at high temperatures, according to ISO TR7471.

THE “AESTHETIC VALUE” OF PhoNoFire®

Drainage systems are normally designed to be functional and practical. Coes, on the other hand, has conceived a product which is not just aesthetically “good”.

The attention paid to the design of the details is intended to define new quality standards for transport, storage, installation of the system.

PIPES

- Marking
- Socket protection
- Marking on strapping



FITTINGS

- Industrial Design and compactness of parts
- Blocks with Logotype and product info
- Adhesive label with bar code and article description
- New Packaging

PhoNoFire® obtained the Design Plus 2005 award run by the Frankfurt Trade Fair in collaboration with the German Design Council, for its product concept and innovative industrial design.



MULTI-LAYER PIPE

The pipe consists of three layers:

INTERMEDIATE LAYER:

**Self-extinguishing PP
Co-polymer compound
+ mineral fillers**

- High sound absorption

EXTERNAL LAYER:

**Self-extinguishing PP
Co-polymer compound
+ mineral fillers**

- Euroclass B fire resistance
- High resistance against impacts and atmospheric agents

INTERNAL LAYER:

**Self-extinguishing PP Co-polymer +
white self-extinguishing PP Co-poly-
mer compound**

- Liquids flow freely without leaving deposits; resistance to chemical agents.
- The white colour makes for easy internal inspection

Pipe socket protection

The pipe sockets are protected by a special thermoformed plastic sheath for safer transport and storage.



FITTINGS

They are made from a self-extinguishing co-polymer PP compound and mineral fillers.

The “double-lip” sealing gasket is co-moulded onto a polypropylene ring which is mechanically inserted into the socket of the fitting.

The gasket is non-removable to guarantee a perfect hydraulic seal, even under back-flow conditions, and total safety during installation.

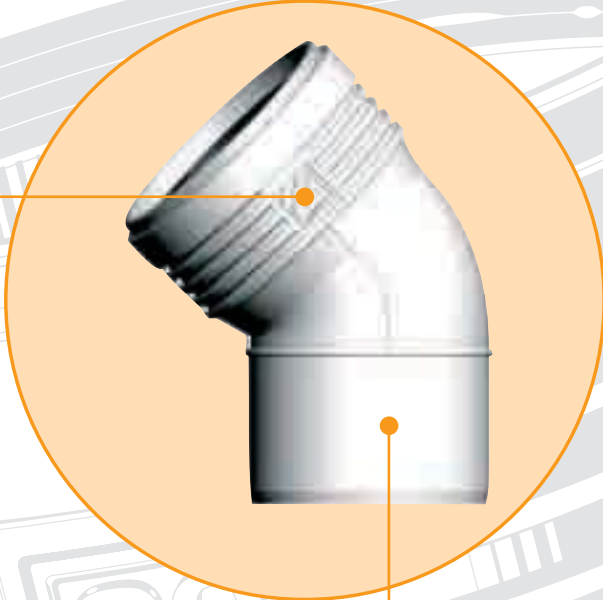


The fittings' design is technological and innovative. PhoNoFire® obtained the Design Plus 2005 award run by the Frankfurt Trade Fair in collaboration with the German Design Council for its industrial design.

The inserts moulded on the socket of the fitting also display the following information:

Insert 1: Company brand

Insert 2: Product brand, article description, reference standards



PhoNoFire
EN 13501-1:2002
B - S ₃ , d0
HTB 110 45°

E.g.: PhoNoFire®
EN 13501-1: 2002 B-S₃, d0
HTB 110/45°

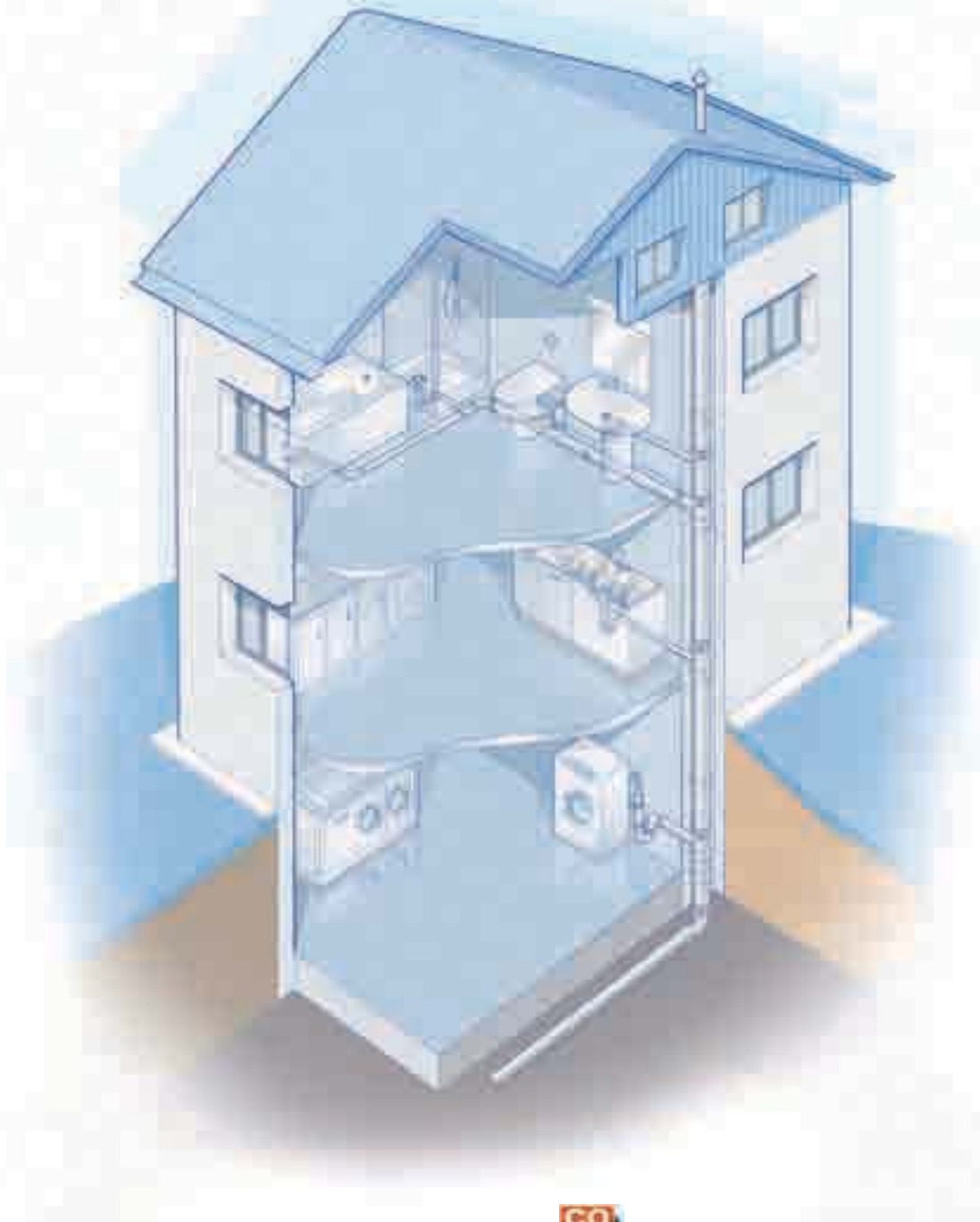
All the fittings are supplied with an adhesive label showing the barcode, article code and description of the part



FIELDS OF USE

Thanks to its sound absorbency and resistance to fire, PhoNoFire® is particularly recommended for the following applications:

- **Private residential buildings** (condominiums, single and multi-family homes)
- **Private commercial buildings** (hotels, shopping centres, offices, boats)
- **Public buildings** (schools and hospitals)



MOUNTING THE SYSTEMS

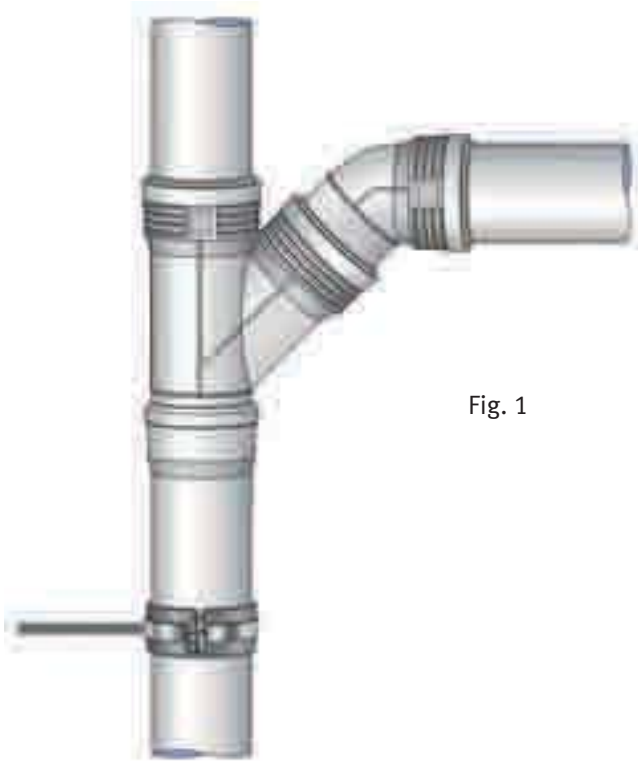


Fig. 1

Immediately after mounting, the vertical systems must be attached with brackets, placed under the sleeve, to prevent them from slipping (Fig. 1).

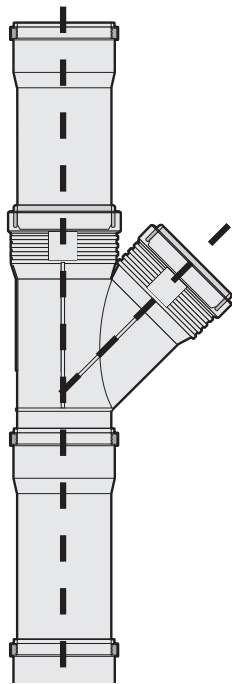


Fig. 2

A three-way sleeve is used to insert a branch onto an existing pipe. This is achieved by cutting a portion of the pipe, equal to the length of the branch to be inserted plus the depth of the sleeve insertion. The sleeve is inserted in the upper part up to the strike plate and the branch is inserted in the part below with an HTU sleeve. Finally the end of the sleeve is inserted on the branch socket (Fig. 2).

The length of the connection socket has been calculated to absorb the thermal expansion of pipes to a maximum of 2 metres.

It is usual to calculate a thermal expansion of 5 mm per metre in the wastewater drain and 2 mm per metre in rainwater pipes.

Thermal expansion must be taken into account when constructing the system. For this purpose, a fixed point must be installed under the sleeve of every pipe which will lock that part of the system, leaving the remaining part free to expand.

Fixed point

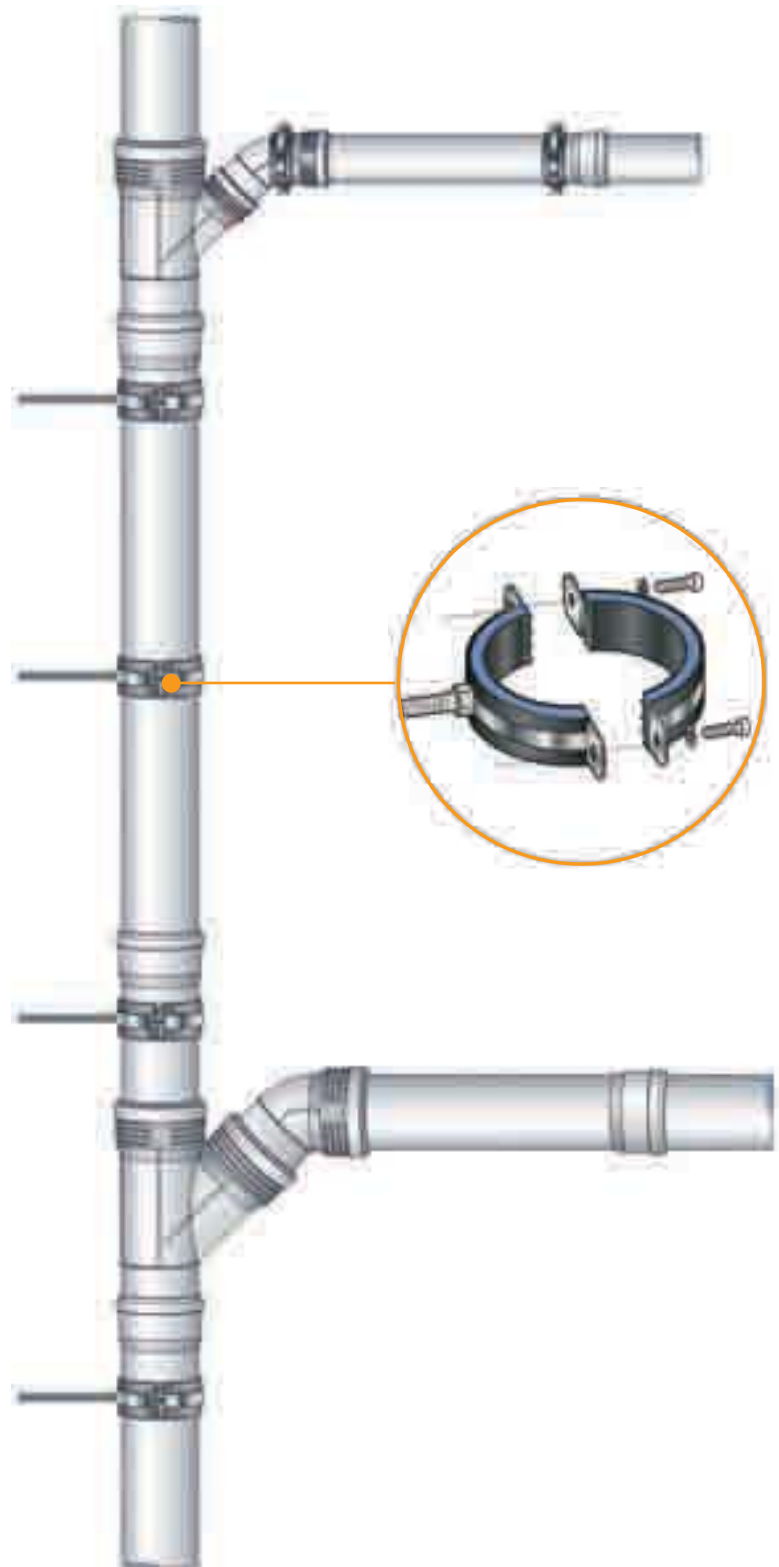
Suitable brackets with a smooth internal surface and rounded edges are used for the installation of a fixed point.

Movable point

Brackets for movable points have the task of keeping the system aligned and allowing free expansion. For sound-proofing reasons, we recommend the exclusive use of brackets with internal protective bands.

The recommended distance between each bracket is:

- For horizontal pipes: 10 times the diameter of the pipe.
- For vertical pipes: 15 times the diameter of the pipe.



N.B. When installing and using the PhoNoFire® system, any national laws and regulations must be taken into consideration. The socket connection system guarantees hydraulic seal. Any mechanical stress must be considered during the design phase so that the hydraulic seal is not affected.

“SOCKET” CONNECTION



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

“Socket” connection is easy and quick:

- 1** Clean the pipe and sleeve ends.
- 2** Check the integrity of the gasket in the socket (Fig. 1)
- 3** Lubricate the part to be connected (Fig. 2)
- 4** Insert the pipe up to the socket strike plate; then back-up by 10 mm (Fig. 3)
- 5** PhoNoFire® pipes and fittings have a perfectly bevelled edge to facilitate connection. If pieces of pipe are used, make a precise and perpendicular cut (Fig. 4) Then, bevel using suitable equipment, to avoid damaging the gasket during connection (Fig. 5)

THE SPECIAL DOUBLE-JOINT

To connect smooth pipes (no socket) use the special double-joint sleeve.

This connection allows any pieces of pipe to be re-used.

Make the joint by performing the following operations:

- 1 Clean the end of the pipe to be connected
- 2 Check the condition of the sleeve and clean the ends
- 3 Install the clamp on the pipe to be connected (Fig. 1)
- 4 Apply a lubricant inside the sleeve (do not use oil or grease) (Fig. 2)
- 5 Apply a small quantity of lubricant to the mouth of the clamp (fig. 3)
- 6 Insert the sleeve of the clamp up to the strike plate and check that it is inserted correctly (Fig. 4)
- 7 Apply the lubricant to the gasket mounted on the opposite part of the double-joint.
- 8 Insert the pipe or fitting completely (Fig. 5)



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

NO

YES



Fig. 1

Here are a few tips to help you maintain PhoNoFire® pipes in good condition over time:

1 Avoid disorderly transport, if pipes have been removed from their original factory packaging (Fig. 1)

2 Avoid dragging along the ground or against the walls of the vehicle (Fig. 2)

3 To avoid deformation over time, the maximum stacking height must not exceed 2 m, regardless of diameter (Fig. 3)

4 Outdoor storage must be limited to a maximum of 2 years (Fig. 3)

5 Pipes should be leaned on even surfaces with no rough spots

NO

YES



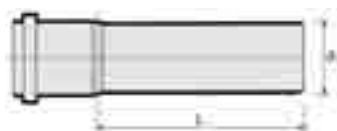
Fig. 2

Max 2 years



Fig. 3

Pipe with one socket HTEM



CODE	d	L
105801W	58	150
105802W	58	250
105805W	58	500
105810W	58	1000
105820W	58	2000
105830W	58	3000
107801W	78	150
107802W	78	250
107805W	78	500
107810W	78	1000
107815W	78	1500
107820W	78	2000
107830W	78	3000
100901W	90	150
100902W	90	250
100905W	90	500
100910W	90	1000
100915W	90	1500
100920W	90	2000
100930W	90	3000
101101W	110	150
101102W	110	250
101105W	110	500
101110W	110	1000
101115W	110	1500
101120W	110	2000
101130W	110	3000
101301W	135	150
101302W	135	250
101305W	135	500
101310W	135	1000
101315W	135	1500
101320W	135	2000
101330W	135	3000
101601W	160	150
101602W	160	250
101605W	160	500
101610W	160	1000
101615W	160	1500
101620W	160	2000
101630W	160	3000
102002W	200	250
102005W	200	500
102010W	200	1000
102020W	200	2000
102030W	200	3000

Bend HTB

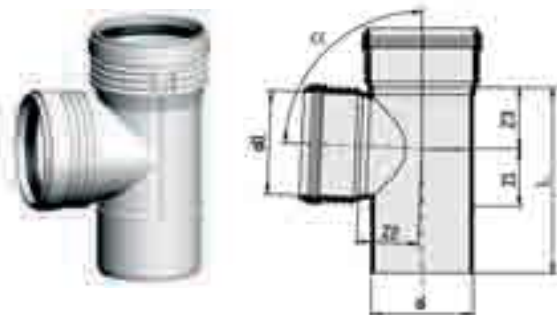


CODE	d	α	z1	z2	L
115815W	58	15°	6	15	67
115830W	58	30°	8	20	70
115845W	58	45°	12	22	75
115867W	58	67°30'	20	30	83
115887W	58	87°30'	28	40	98
117815W	78	15°	7	15	77
117830W	78	30°	10	20	82
117845W	78	45°	15	26	88
117867W	78	67°30'	23	37	98
117887W	78	87°30'	32	51	113
110915W	90	15°	8	15	75
110930W	90	30°	14	20	85
110945W	90	45°	21	28	88
110967W	90	67°30'	34	40	100
110987W	90	87°30'	50	56	117
111115W	110	15°	9	20	88
111130W	110	30°	16	28	93
111145W	110	45°	25	35	100
111167W	110	67°30'	41	47	116
111187W	110	87°30'	60	70	128
111315W	135	15°	12	22	104
111330W	135	30°	18	30	113
111345W	135	45°	30	40	126
111367W	135	67°30'	48	58	143
111387W	135	87°30'	70	80	165
111615W	160	15°	12	20	103
111630W	160	30°	23	30	117
111645W	160	45°	36	45	128
111667W	160	67°30'	58	64	151
111687W	160	87°30'	84	90	176
112045W	200	45°	48	70	145
112087W	200	87°30'	100	118	205

Ventilation bend

CODE	d
591100W	110

Branch HTEA



CODE	d-d1	α	z1	z2	z3	L
205858W	58-58	45°	13	75	75	150
255858W	58-58	67°30'	24	48	48	132
305858W	58-58	87°30'	36	40	40	136
207858W	78-58	45°	6	92	89	164
257858W	78-58	67°30'	24	58	53	146
307858W	78-58	87°30'	37	49	40	146
207878W	78-78	45°	16	99	99	186
257878W	78-78	67°30'	29	63	63	162
307878W	78-78	87°30'	46	47	47	162
209058W	90-58	45°	1	97	90	157
309058W	90-58	87°30'	36	53	40	142
209090W	90-90	45°	21	109	109	196
309090W	90-90	87°30'	51	53	53	169
201158W	110-58	45°	-7	115	104	179
251158W	110-58	67°30'	14	84	65	150
301158W	110-58	87°30'	35	62	40	147
201178W	110-78	45°	21	124	116	192
251178W	110-78	67°30'	24	86	76	171
301178W	110-78	87°30'	45	64	52	169
201111W	110-110	45°	25	134	134	232
251111W	110-110	67°30'	42	89	89	201
301111W	110-110	87°30'	60	66	66	200
201311W	135-110	45°	15	159	149	255
301311W	135-110	87°30'	64	78	66	219
201313W	135-135	45°	32	168	168	292
301313W	135-135	87°30'	71	81	81	243
201611W	160-110	45°	0	176	160	255
201616W	160-160	45°	36	193	193	322
301616W	160-160	87°30'	84	89	89	265
202016W	200-160	45°	20	231	223	342
202020W	200-200	45°	47	240	240	385

Parallel branch

CODE	d-d1
581100W	110-110

Double branch HTDA



CODE	d-d1-d2	α	z1	z2	z3	L
381111W	110-110-110	87°30'	60	66	66	200

Swept-entry branch



CODE	d-d1	z1	z2	z3	L
221111W	110-110	73	61	82	207
221190W	110-90	57	57	82	188

Linear inspection HTRE



CODE	d	H	L
325858W	58	82	150
327878W	78	82	157
320909W	90	86	157
321111W	110	95	195
321313W	135	112	225
321616W	160	126	238

Coupling HTU



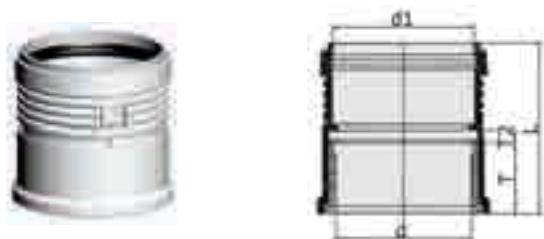
CODE	d	L
405810W	58	120
407810W	78	135
400910W	90	132
401110W	110	132
401310W	135	174
401610W	160	180
402010W	200	192

Coupling with shutter HTMM



CODE	d	x	L
405820W	58	4	120
407820W	78	4	135
400920W	90	4	132
401120W	110	4	132
401320W	135	5	174
401620W	160	5	180

Double joint



CODE	d-d1	T	T1	T2	L
415800W	58-58	48	5	15	119
417800W	78-78	48	6	16	119
410900W	90-90	47	6	16	124
411100W	110-110	48	6	16	124
411300W	135-135	65	6	16	145
411600W	160-160	65	6	16	147

Increase HTR



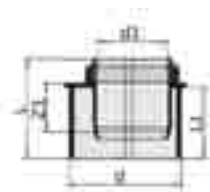
CODE	d1-d	z1	L
155878W	58-78	20	91
155809W	58-90	28	97
155811W	58-110	42	116
157809W	78-90	16	84
157811W	78-110	30	104
150911W	90-110	20	95
151113W	110-135	28	123
151116W	110-160	43	138
151316W	135-160	29	124
151620W	160-200	35	138

Closing plug HTM



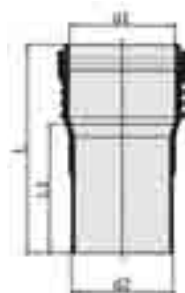
CODE	d	L
395800W	58	40
397800W	78	45
390900W	90	50
391100W	110	50
391300W	135	60
391600W	160	70

Fitting for PE/PP - PNF connection



CODE	d
625804W	58/40
625805W	58/50
627805W	78/50
627807W	78/75
621312W	135/125

Fitting for PNF - PE/PP/PVC connection



CODE	d
635805W	58/50
637807W	78/75
631312W	135/125

Fitting for PE - PNF connection



CODE	d
645856W	58/56
646358W	63/58
647863W	78/63

Compression grommet for the connection to cast iron pipe

CODE	d
675800W	58
677800W	78
671100W	110
671300W	135
671600W	160



Soundproof band with M10 threaded nut

CODE	d
565800	58
560700	78
560900	90
561100	110
561300	135
561600	160
562000	200

Soundproof band with 1/2" gas-threaded nut

CODE	d
575800	58
570700	78
570900	90
571100	110
571300	135
571600	160
572000	200