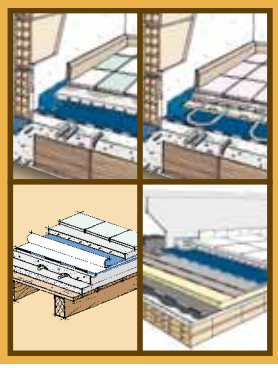
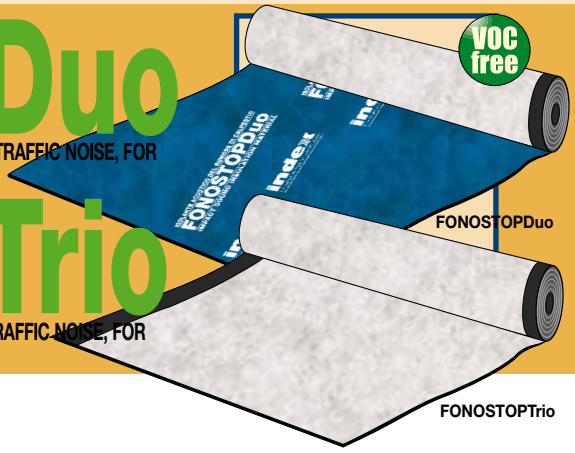


FONOSTOPDuo

DOUBLE LAYER HIGHLY RESILIENT ACOUSTIC INSULATION AGAINST FOOT TRAFFIC NOISE, FOR INDOOR AND OUTDOOR FLOOR SLABS WITH FLOATING FLOOR

FONOSTOPTrio

TRIPLE LAYER HIGHLY RESILIENT ACOUSTIC INSULATION AGAINST FOOT TRAFFIC NOISE, FOR INDOOR AND OUTDOOR FLOOR SLABS WITH FLOATING FLOOR



CHARACTERISTICS		IMPACT ON THE ENVIRONMENT		
ACOUSTIC INSULATION	FIRE REACTION	ECO GREEN	RECYCLABLE	NON-DANGEROUS WASTE

PROBLEM

The installation of resilient material between the floating screed, on which any type of flooring can be laid, and the load-bearing floor slab, reduces the spreading of impact noise or foot traffic noise (ΔL_w) and increases insulation against airborne noise (ΔR_w). It also represents the most flexible and effective insulation technique available.
DPCM dated 5th December 1997 (Premier's Decree) imposes different levels of insulation based on what the building is to be used for, hence the need to avail of modular insulating materials that enable the assembly of systems proportioned with the different levels of insulation imposed by the decree and also of superior insulation systems for absolute comfort. The levels of insulation against foot traffic noise determine the need to avail of insulating materials of maximum efficiency but that are thin enough to be compatible with the parameters usually foreseen in the plans of the building. Furthermore, seeing as the acoustic specifications are measured on site, such insulation materials must also be compatible with the real situation of the building site; they consequently must be resistant to the noise of men and equipment and they must not move while the floorings are laid.

SOLUTION

To resolve the above-mentioned problems, INDEX has created **FONOSTOPDuo** and **FONOSTOPTrio**, which alone or combined together, are able to satisfy any insulation requirements against foot traffic noise.
FONOSTOPDuo and **FONOSTOPTrio** are designed for the building trade and are not made from recycled products nor do they derive from different fields of application.
FONOSTOPDuo is a thin yet highly effective acoustic insulation product against foot traffic noise, and represents the most efficient insulation method against foot traffic noise of the product range of INDEX. It is made up of a sound-resistant foil, coupled with a sound-resilient non-woven polyester fabric obtained with a special "elastic needling" procedure, being an exclusive INDEX project.
The sound-resistant foil is a seamless waterproof and airtight element, which optimises acoustic performance by filling-in pores that may occur in the building work, through which airborne noise would spread, consequently re-establishing continuity, being an appreciated feature especially in discontinuously laid floors.
The foil also stops the fresh cement grout, spread over the insulation material when creating the screed, from encapsulating the fibres of the non-woven fabric, which would consequently eliminate its elastic properties.
The non-woven fabric is an elastic separation layer between rigid elements, screed and floor slab, which reduces the transmission of vibrations caused by foot traffic on the paved floating screed and also vibrations of the screed induced by airborne noise deriving from various sound sources such as voices, radios, televisions, etc.
The fibrous nature of the non-woven fabric, even if very thin, represents another element that favours the insulating capacities of the material also against airborne noise that closed cell insulating materials do not offer. The fibres are not irritant, they are flexible and do not crumble when compressed or folded.
The special texture of the non-woven fabric determines the natural dry adherence of the fibres to the laying surfaces in cement of slightly rough surfaces on which they generally lie, similar to a "Velcro effect", which prevents the sheet from moving when subsequently laying the flooring. Even though **FONOSTOPDuo** is a relatively light product, once it is laid, it "sticks" to the foundations and does not move.
FONOSTOPDuo, is also resistant to static and dynamic punching, therefore it is resistant to both building site traffic during laying and to the perforating action of rough parts of irregular foundations under the load of the floating screed in the work phase.
The sound-resilient non-woven fabric acts as a spring in the physical "spring-mass" system model, in which a mass, being the floating screed, is loaded on a spring, being the sound-resilient fabric, resting on a rigid support, being the load-bearing floor slab.
The relatively low unit load of the floating screed (0.008÷0.012 kg/cm^2) means that materials commonly defined to be elastic, such as rubber sheeting, in the specific case, have excessive dynamic stiffness, making them inadequate to absorb vibrations generated by foot traffic on the screeds whereas, within specifically defined limits of non-excessive compressibility, softer materials such as **FONOSTOPDuo** have the just dynamic stiffness which, proportioned with the low unit load of the screed, determine excellent insulation.
FONOSTOPDuo has the best level of dynamic stiffness of the series of acoustic insulation against foot traffic noise produced by INDEX. **FONOSTOPDuo** is produced in rolls of 1,05×10 meters.
The sound-resistant foil of the top face, which is lined with a light-blue non-woven polypropylene textile finish, is 5 cm longer than the white non-woven sound-resilient fabric of the bottom face; this is done to create an overlap wing, which protects the side joining line of the sheets against the intrusion of cement mortar of the screed, which would otherwise create an acoustic bridge once it sets hard.
FONOSTOPTrio is a triple layer insulation product made up of the same elements as **FONOSTOPDuo** but in this case, the sound-resistant foil is also lined on the top face with the same non-woven fabric that lines the bottom face.
FONOSTOPTrio completes the performance of the insulation product from which it derives because when it is combined with **FONOSTOPDuo**, it obtains an even higher dynamic stiffness of the system to be able to satisfy the insulation requirements of light floor slabs or for particular requirements that are higher than legal limits.
FONOSTOPTrio is produced in rolls of 1,05×8 meters. To obtain the seamless effect of the non-woven fabric after laying, it has two 5 cm overlap wings set opposite each other on both faces of the sheet.
INDEX has designed and certificated three insulation systems based on the combined use of **FONOSTOPDuo** and **FONOSTOPTrio**, which resolve insulation problems of the most common types of floor slabs.

MODULAR ACOUSTIC INSULATION AGAINST FOOT TRAFFIC NOISE

The table that follows indicates the foot traffic noise levels L'_{nw} and the increase in soundproofing power ΔR_w for a floor slab of 20+4 in clay-cement mix of 237 kg/m^2, with 7 cm of lightened foundation with a density of 800 kg/m^3 that starts from a level of foot traffic noise of $L_{nw,eq}$=77,66 dB and soundproofing power of R_w=48,74 dB (screed included) insulated with floating screed of 5 cm (d:2000Kg/m^3) on the three afore-mentioned systems, which can be calculated with the simplified calculation method foreseen in standard EN 12354-2.

	System	Laboratory characteristics		Performances according to EN 12354-2		
		Certificate I.T.C. n.	Dynamic stiffness	ΔL_w	$L_{n,w}$ insulated floor (K=3 dB)	ΔR_w
A	FONOSTOPDuo	3402/RP/01	21 MN/m^3	28 dB	53 dB	7,63 dB
B	FONOSTOPDuo+FONOSTOPDuo	3403/RP/01	11 MN/m^3	32 dB	48 dB	10,63 dB
C	FONOSTOPTrio+FONOSTOPDuo	3404/RP/01	9 MN/m^3	33,5 dB	47 dB	10,63 dB

METHOD OF USE AND PRECAUTIONS

SYSTEM A. The rolls of **FONOSTOPDuo** are to be unrolled in their natural unrolling direction with the top light-blue face facing upwards and are to be overlapped at the sides by arranging the overlap wing on the adjacent sheet and carefully matching-up the non-woven fabric of the faces underneath.
On the short side, the sheets are not overlapped but carefully brought together end-to-end. The sheets will cover the whole floor slab and are to be blocked and trimmed-off at the foot of the perimeter walls of the room to be insulated.
All the longitudinal overlapping lines and the transversal joining lines of the sheets are then to be carefully sealed with the special adhesive SIGILTAPE, stuck over the same.
To insulate the floating screed from perimeter walls, the latter are to be lined with 10 cm of the extruded polyethylene separation self-adhesive **FONOCELL** strip, to limit the thickness of the screed, which will be turned over by 5 cm and glued on the insulation material laid on the floor slab where it will be further secured with adhesive SIGILTAPE.
Note. Make sure you lay FONOCELL on terraces only after the waterproof coat has been protected by a layer of plaster mortar reinforced with a metal net and make sure to seal the gap between the flooring and the skirting board with a flexible sealant.

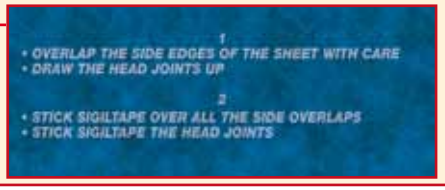
SYSTEM B. If you are installing **FONOSTOPDuo** in a double layer, the first layer will be laid on site in the opposite direction to the natural unrolling direction of the roll, with the top light-blue face facing the floor slab and the white face facing upwards. Overlap the sheets lengthwise along the overlap strip and bring the ends of the sheets together without overlapping them; the sheets of the first layer will cover the whole floor slab and are to be blocked and trimmed-off at the foot of the perimeter walls of the room to be insulated but not sealed.
The second layer will then be unrolled parallel with the first layer, in its natural unrolling direction, with the top light-blue face facing upwards, making sure to offset it to lay it over the joining lines of the first layer
The laying and sealing methods of the second sheet will be those already explained for system A laid in a single layer.

SYSTEM C. In the system made up of **FONOSTOPTrio + FONOSTOPDuo**, the first layer to be laid will be the **TRIO** type. The rolls will be unrolled on the laying surface, overlapping them lengthwise along the dedicated overlap strips while the ends of the sheets will be brought together without overlapping them.
The sheets of the first layer will cover the whole floor slab and are to be blocked and trimmed-off at the foot of the perimeter walls of the room to be insulated but not sealed.
The second layer, made up of the **DUO** type, will be unrolled parallel with the first layer, in its natural unrolling direction, with the top light-blue face facing upwards, making sure to offset it to lay it over the joining lines of the first layer
The laying and sealing methods of the second sheet will be those already explained for system A laid in a single layer.

SYSTEM A
FONOSTOPDuo

SYSTEM B
FONOSTOPDuo+FONOSTOPDuo

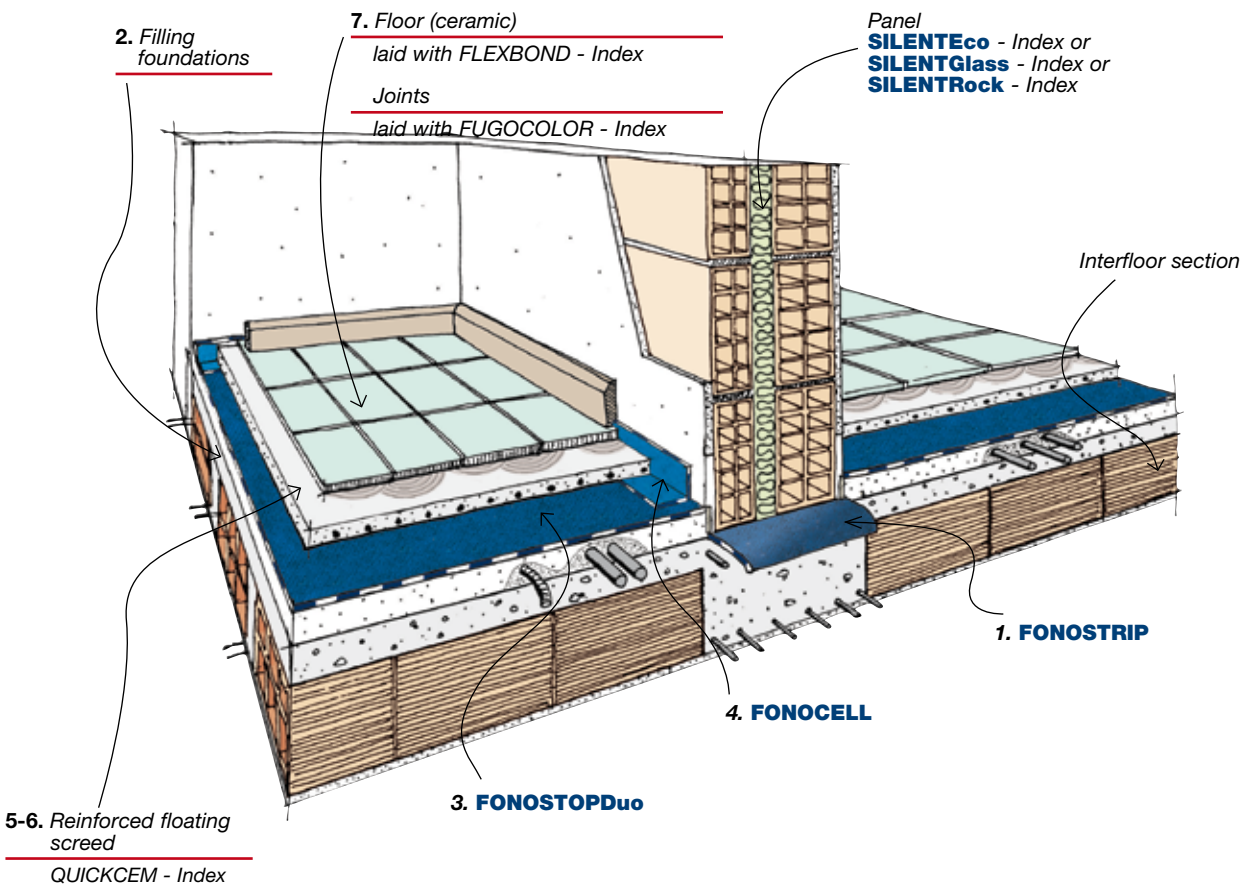
SYSTEM C
FONOSTOPTrio+FONOSTOPDuo



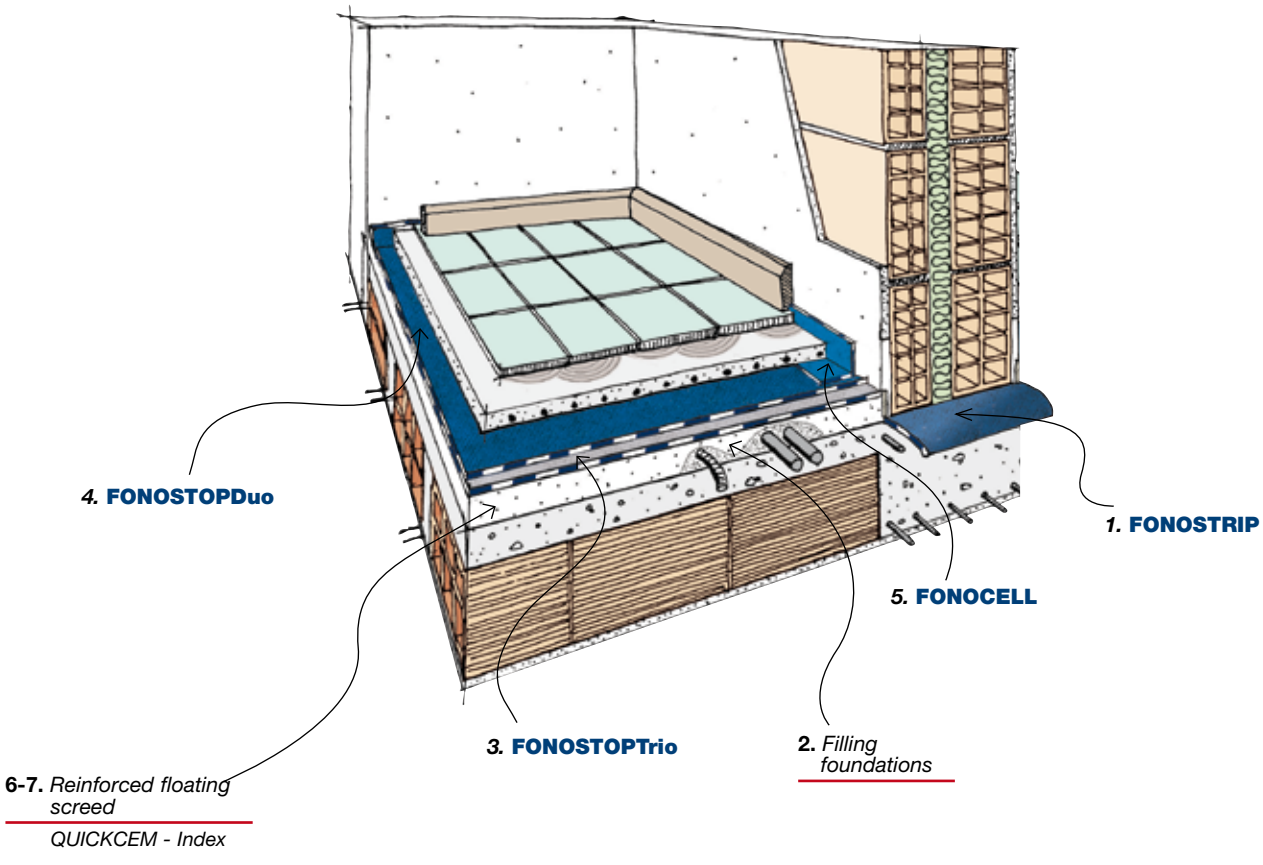
INDEX has customised the top surface finish of FONOSTOPDuo, by printing some important laying instructions on it in order to help the builder when preparing the floating screed to insulate against foot traffic noise.

TECHNICAL INTERVENTION SOLUTIONS

ACOUSTIC INSULATION FOR FLOORS AGAINST FOOT-TRAFFIC NOISE



HIGH PERFORMANCE ACOUSTIC INSULATION FOR FLOORS AGAINST FOOT-TRAFFIC NOISE
FONOSTOPTrio + FONOSTOPDuo



	FONOSTOPDuo	FONOSTOPTrio
Thickness	7,5 mm approx	11 mm approx
Roll size	1,05×10,0 m	1,05×8,0 m
Width • phonoresilient foil • Non-woven fabric • edge	 1,05 m 1,00 m 0,05 m	 1,05 m 1,00 m 0,05 m (double)
Mass per unit area	1,6 kg/m²	3,0 kg/m²
Impermeability	Waterproof	–
Aqueous vapour diffusion coefficient (phonoresilient foil)	μ 100.000	μ 100.000
Thermal conductivity λ	0,039 W/mK (8)	0,039 W/mK (8)
Heat capacity per unit area (7)	1,620 KJ/m²K	2,840 KJ/m²K
Thermal resistance **R**	0,135 m² K/W (8)	0,230 m² K/W (8)
Acoustic insln.against foot-traffic noise (ISO717/82, UNI8270/7)		
ISO evaluation index at 500 Hz • bare floor (thickness: 240 mm) • floor with "floating flooring" Improvement as a difference between the two indices (6)	 **I**:74.0 dB $\mathbf{I_i}$:40.5 dB $\Delta\mathbf{L_i}$:33.5 dB	 – – –
Dynamic stiffness (ITC certificate conforming to UNIEN29052 p. 1st) load 200 kg/m² • FONOSTOPDuo single layer • FONOSTOPDuo double layer (4) • FONOSTOPTrio single layer • FONOSTOPTrio+FONOSTOPDuo	Apparent dynamic stiffness s'_t = 4 MN/m³ s'_t = 2 MN/m³	Dynamic stiffness s' = 21 MN/m³ (1) s' = 11 MN/m³ (2)
	Apparent dynamic stiffness s'_t = 2 MN/m³	Dynamic stiffness s' = 14 MN/m³ s' = 9 MN/m³ (3)
Compression tests under constant load of 200 kg/m² (EN 1606) • FONOSTOPDuo single layer • FONOSTOPDuo double layer (4) • FONOSTOPTrio+FONOSTOPDuo	Reduction of thickness ≤1 mm ≤1 mm –	Reduction of thickness ≤1 mm
Compression capability (EN 12431:2000 - Determination of thickness) • FONOSTOPDuo single layer • FONOSTOPDuo double layer (4)	 ≤2 mm ≤3 mm	 – –
Volatile Organic Compound (VOC) emissions (EN ISO 16000-9) • after 48 hours • after 28 days	 << minimal value required by prEN 12052 (9) << minimal value required by prEN 12052 (9)	 – –
Fire reaction class	**Class 1** (5)	–
Certifications	ITC CSI Istituto Giordano CATAS	ITC

(1) Certificate ITC-CNR n. 3402/RP/01. (2) Certificate ITC-CNR n. 3403/RP/01. (3) Certificate ITC-CNR n. 3404/RP/01. (4) FONOSTOPDuo laid in double layer with opposing white faces.
(5) Approval of the Ministry of Interior No. VR2172B41C100002. - (6) Certificate CSI n. ME06/060/98. (7) Apparent value obtained by calculating values of every component expressed per unit area of whole product (m²)
(8) Value established on the material subjected to a load of 1 KPa (100 kg/m²).- (9) Certificate "CATAS" - Research and development centre and test laboratory for the wood-furnishing industry n. 109570/1.
WARNING: only the dynamic stiffness values **s'**, ringed in red, are values useful for an estimate calculation conforming to standard EN 12354-2.

THEORETICAL ESTIMATE OF THE REDUCTION LEVEL IN FOOT TRAFFIC NOISE

Example of simplified calculation method
TR UNI 11175 - (Guide to the Standards of UNI EN 12354 series for predicting the acoustic performance of buildings) for
FLOOR SLAB of 20+4 IN CLAY-CEMENT MIX OF 300 kg/m²
LIGHTENED FOUNDATION WITH DENSITY OF 300 kg/m³ thickness 10 cm
Total mass per unit area **m'**=330 kg/m²
$L_{n,w,eq}$ = 164 - 35 log m = 76 dB
SCREEDS WITH SURFACE DENSITY **m'**=100 kg/m²
Calculation of the **fo** resonance frequency of the floating screed system, resilient layer:

FONOSTOPDuo single-layer

$fo = 160 \sqrt{\frac{s'}{m'}} = 73$ Hz

$\Delta L_w = 30 \text{ Log } (\frac{f}{fo}) + 3 =$ **28 dB**

where **f** = 500 Hz (of reference)

$L_{n,w} = L_{n,w,eq} - \Delta L_w + K$

where **K** = 3

$L_{n,w}$ **= 51 dB**

FONOSTOPDuo double-layer

$fo = 160 \sqrt{\frac{s'}{m'}} = 53$ Hz

$\Delta L_w = 30 \text{ Log } (\frac{f}{fo}) + 3 =$ **32 dB**

where **f** = 500 Hz (of reference)

$L_{n,w} = L_{n,w,eq} - \Delta L_w + K$

where **K** = 3

$L_{n,w}$ **= 47 dB**

FONOSTOPDuo+FONOSTOPTrio

$fo = 160 \sqrt{\frac{s'}{m'}} = 48$ Hz

$\Delta L_w = 30 \text{ Log } (\frac{f}{fo}) + 3 =$ **33,5 dB**

where **f** = 500 Hz (of reference)

$L_{n,w} = L_{n,w,eq} - \Delta L_w + K$

where **K** = 3

$L_{n,w}$ **= 45,5 dB**

ANIT Associated

The data in this publication is the result of laboratory tests or observations on site and this does not guarantee the repeatability of the results in equivalent systems.

• FOR ANY FURTHER INFORMATION OR ADVICE ON PARTICULAR APPLICATIONS, CONTACT OUR TECHNICAL OFFICE • IN ORDER TO CORRECTLY USE OUR PRODUCTS, REFER TO INDEX TECHNICAL SPECIFICATIONS •

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