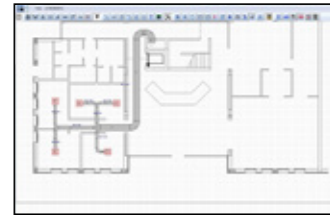# P3ductility: our digital ecosystem

P3ductware • P3ductvalue

P3ductbim • P3ductility • P3ductbravo

P3ductware

Software for the dimensioning and design of air duct systems. The software guarantees: design on a two-dimensional level, cad interface (import/export), scale rendering, acoustic behaviour calculation of the system, compilation of a bill of quantities, interface with the P3ductbravo software.
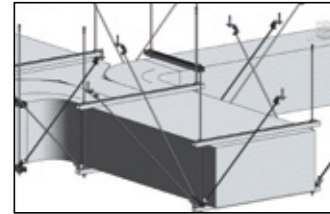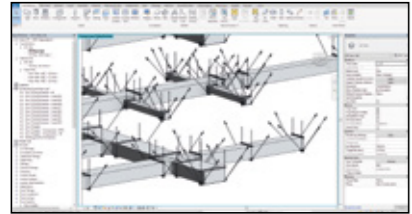
P3ductbim new

BIM library, specially designed for P3ductal ducts, compatible with Revit. The new release offers an automatic positioning of the seismic bracing based on the calculation tables in the special seismic P3ductal handbook.
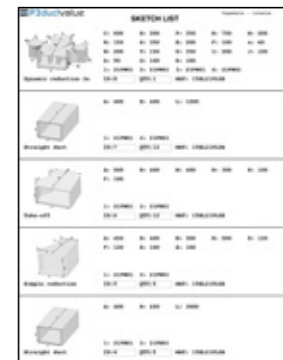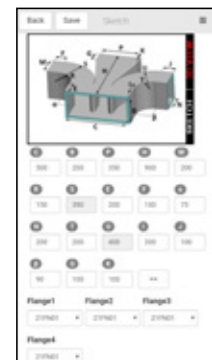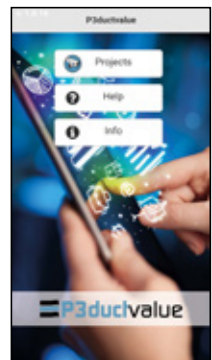
P3ductvalue new

Web app, usable via smartphone and PC for a remote access, even off-line, to the P3ductal duct library. The app allows:
- quick insertion of ducts in order to work directly on site;
- materials and accessories quote preparation;
- duct sketches;
- order importation into P3ductbravo.
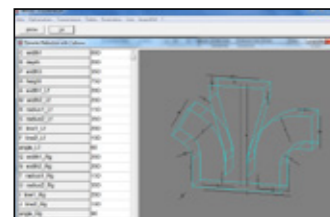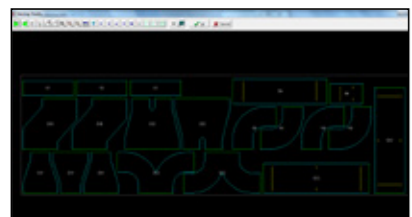
P3ductbravo new

Software for sketching and controlling the automatic duct-cutting machine.

The new release is characterized by:
- the new advanced nesting algorithm;
- the resizable imagining of articles.

P3ductal innovation*lab*

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P3ductal
preinsulated aluminium ducts system

New: products and solutions

Sandwich panels with recycled content

Circular economy is a term for defining an economic system designed to be able to regenerate on its own. There is no waste in this system. The biological and technical components of a product are designed with the presupposition of adapting within a material cycle, designed for disassembly and re-proposition.

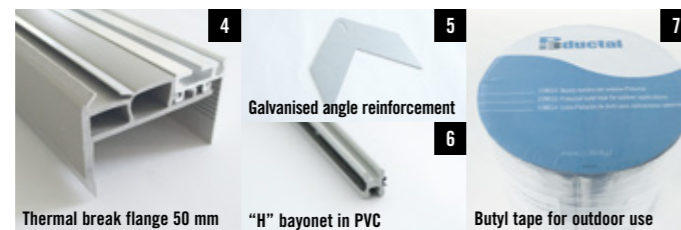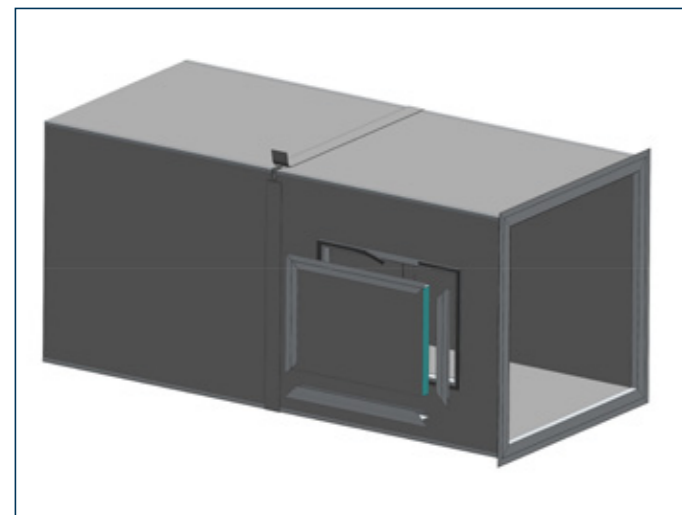### From PET water bottles to water-expanded insulation

The 20 and 30 mm thick Piral HD Hydrotec panels have been certified by TÜV ITALY in accordance with the requirements specified in the following documents:
- UNI EN ISO 14021:2016 Environmental labels and declarations - Self-declared environmental claims (type II environmental labelling)
- USGBC LEED® v4 for Building Design and Construction
- D.M. 11.01.2017 Adoption of minimum environmental criteria for interior furniture, construction and textiles

in relation to the content of recycled material.

The P3ductal panel with recycled content meets the minimum environmental criteria laid down in the European GPP Green Public Procurement Directive which, in order to reduce the use of non-renewable resources and increase waste recycling, rewards projects that use materials made of renewable and recycled raw materials.
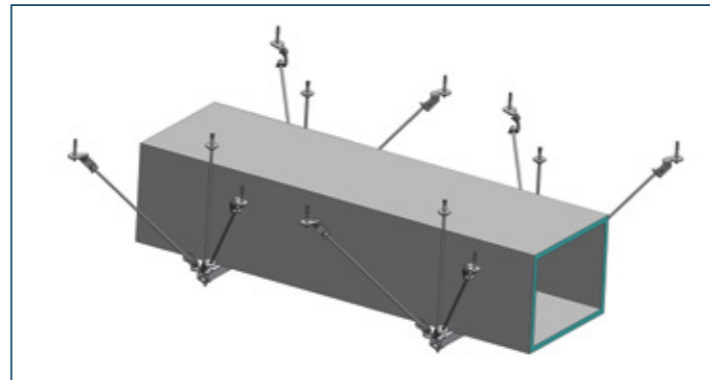
Accessories for the 50 mm duct

P3ductal outdoor special outdoor applications duct(al) system

"U" profile 50 mm   "chair" profile 50 mm   "F" profile, 50 mm

Thermal break flange 50 mm   "H" bayonet in PVC   Butyl tape for outdoor use

1	21PR51	Aluminium "U" profile 50 mm
2	21PR52	Aluminium "chair" profile 50 mm
3	21PR53	Aluminium "F" profile, 50 mm

4	21FN44	Thermal break flange 50 mm
5	21SQ06	Galvanised angle reinforcement bracket 50 mm
6	21FN04	H" bayonet in PVC
7	21NS10	Butyl tape for outdoor use

Seismic bracing system

Swivel bracket   "C" support profile   Seismic anchor

Steel anchor   Washer - Hexagon M8 nut   Threaded sleeve - Threaded rod

Special anchoring system for seismic bracing. The system is composed by a "C" support profile, swivel bracket, threaded bar, special seismic anchors for ceiling fixing and fasteners.

1	21AS01	Swivel bracket for seismic bracing
2	21AS08	"C" Support profile in aluminium
3	21AS02	Seismic resistant anchor

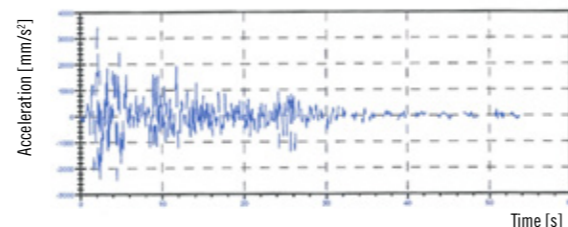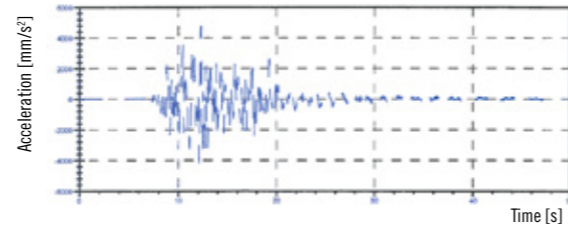| 4	21AS03	Steel anchor
5	21AS04 - 05	Washer 40 mm - Hexagon M8 Nut
6	21AS06 - 07	Threaded sleeve - Threaded rod M8

Seismic testing

El Centro

Norcia

In order to provide a detailed description of the seismic behaviour of air ducts, the following solutions were tested on a vibrating table:
- sheet metal ducts with a standard supports system;
- P3ductal ducts with a standard supports system;
- P3ductal ducts with a seismic bracing system.

The tests were carried out in the laboratory. Tests were performed by FIP Industriale in Padua.

The research aimed above all to verify the correctness of the engineering choices of the P3ductal seismic bracing system and its "structural robustness". For this reason, two classical accelerograms were chosen and applied to the different duct configurations.

The seismic signals in acceleration, which were copied and transformed into displacements by the actuator, were:

- El Centro (USA, California) dated 18/5/1940, magnitude 6.9 Richter
- Norcia (Italy, Perugia) dated 30/10/2016, magnitude 6.5 Richter.

Seismic Handbook

In order to facilitate the activity of the designers, P3 has created a specific technical handbook dedicated to seismic protection of the aeraulic ducts.

These are the main topics covered in the document:

- Effects of an earthquake on ducting
- Laws and Standards
- Seismic action on ducting
- Designing of seismic air distribution ducting systems
- Seismic testing
- Responsibility profiles
- Pre-dimensioning tables
- Seismic bracing system data sheet
- Types of seismic bracing
- Installation instructions
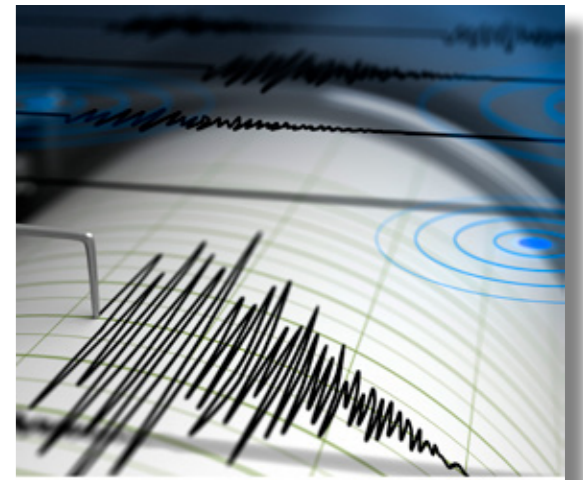
Sheet metal duct with a standard supports system   P3ductal duct with a standard supports system   P3ductal duct with a seismic bracing system

The **sheet metal duct**, having a mass 4 times greater than that of the P3ductal duct:
- has subjected the threaded bars to greater actions, since seismic actions are proportional to the multiplication of mass by acceleration.

Both duct solutions with standard systems showed:
- wide lateral movement (with larger entity for the sheet metal duct) incompatible with the Serviceability and Operational Limit States required by the systems;
- damage to the supporting brackets has been noticed, resulting in permanent deformation at the end of the tests.

The tests have validated the engineering of the **P3ductal seismic bracing system** because:
- the duct was found to be adequately braced, showing that it is well anchored to the supporting structure without showing any residual permanent deformations;
- the duct has demonstrated to be well anchored to the structure without resonance with the natural period of the building;
- the P3ductal seismic bracing system has responded to seismic accelerations without damage, guaranteeing performances in line with the Ultimate, Serviceability and Operational Limit States.