EuroPHit

D3.8_Evaluate Specialist Deep-Retrofit Products Report

Italy

INTELLIGENT ENERGY – EUROPE II

Energy efficiency and renewable energy in buildings

IEE/12/070

EuroPHit

[Improving the energy performance of step-by-step refurbishment and integration of renewable energies]

Contract N°: SI2.645928

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Technical References

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Abstract

General overview of what is the main subject of this report.

'Retrofitting to the EnerPHit standard will require the following initiatives with respect to building materials and products:

- Use of existing materials in a non-typical method such as additional thickness of insulation;
- Use of non-typical (or non-commonly used) materials to achieve the extraordinary performance of the EnerPHit standard, such as airtightness tapes and membranes, foam glass for thermal bridging and triple glazing in windows;
- Testing of new-to-market materials which have had limited application in real-world scenarios; and
- Identification of short-comings in the marketplace in terms of products or materials that would greatly enhance the application of EnerPHit on a broader scale.

It is planned that existing, uncommon and new to market materials and products will be used on each of the step-by-step EnerPHit projects where possible. Where materials are not yet certified for use on public buildings, their properties will be assessed qualitatively by the design and construction teams in terms of their potential for application in EnerPHit projects in future. ' (source: EuroPHit contract)

1 Introduction

1.1 General project description

The existing building is located in Pergine Valsugana (TN). It was built in 1922 to become an oratory for girls and youth center. In 1950 the entire building was raised up with an additional floor. At present, the total treated floor area, 840 m², is divided in three above ground floors and one basement floor. The building is characterized by a compact "T" shape with massive external walls. The wall assembly for the first two floors is made up of local stone and plaster, the third floor built later is in hollow brick. The horizontal elements (ceilings and roof) are mainly realized with timber. All construction elements have no thermal insulation incorporated. The oratory is located in the urban center. The surrounding buildings provide heavy shading, especially on the south facade, limiting considerably the solar gains. The existing windows are single glazed with uninsulated timber frames. The building is primarily heated with two boilers connected with two air handling units (AHU). In addition there are wood stoves in some rooms. The hot water is provided by small electric boilers.

The renovation concept is about the addition of a new volume; the total existing building will be mirrored on the north-south axis. All the structural elements (walls, ceilings and foundations) have to be reinforced in order to respond to the new Italian seismic legislation. The energy retrofit aims to the Passivhaus standard for the all building (existing and extension). It foresees the thermal insulation of the opaque components of the thermal envelope. All the transparent components will be replaced with high energy performance windows (low-e triple glazing filled with argon) and doors. A new technical room is planned in the basement of the building. The ventilation will be provided by 12 ventilation units with heat recovery. A large ventilation unit in the basement will serve the majority of the basement and of the first floor, the other 11 ventilation units are much smaller and are disposed in the first, second and third floors. They provide the ventilation for the remaining parts of the building. Heating and DHW will be provided with district heating. In terms of renewables PV panels will be installed on the roof.

The first step will be concluded within the end of the EuroPHit project and foresees the full renovation of the building envelope and of the building services. This will bring the building to the Passivhaus Classic Standard. We have also planned a second step with the addition of supplementary RES that could bring the building to an even higher energy efficiency class.

1.2 Scope of this report

Brief description of what is the aim of this report.

'generic product types will be qualitatively evaluated by the construction teams using such criteria as those listed below:

- Ease of use, including whether specialist training is required for application;
- Fit for purpose;
- General availability in the marketplace;
- Health and Safety considerations; and
- Cost.

It is anticipated that the construction teams in each country will evaluate 15 generic building products that would be suitable for application in Step-by-step refurbishment to EnerPHit standard. This adds up to 8 construction teams * minimum 15 products=minimum 120 generic products evaluated.' (source: EuroPHit contract)

2 Thermal Insulation

2.1 Spaceloft®, Aspen Aerogels – Thermal Insulation

Spaceloft® is a flexible, nanoporous aerogel blanket insulation that reduces energy loss while conserving interior space in residential and commercial building applications. It can be used for the insulation of walls, floors, roofs, framing, pipes and ducting. It is useful for refurbishment where often there is the problem of a limited space availability.

Figure 1 Spaceloft®, Areogel Tehrmal Insulation (source: http://www.aeropan.it)

Manufacturer	:	Aspen Aerogels
Homepage	:	http://www.aeropan.it/
Product name	:	Spaceloft®
URL:	:	http://www.aeropan.it/it/prodotti/spaceloft/
Fit for purpose	:	Insulation of walls, floors, roofs, framing, pipes and ducting
Thermal conductivity [EN12667]	:	0,014 W/mK
Ease of use	:	Can be installed by common craftsmen. It can be cut using conventional textile cutting tools including scissors, electric scissors, and razor knives.
Availability	:	To be ordered from Ama Composites Srl .

Health /Safety	:	The material can be dusty, and it is recommended gloves, safety glasses, and dust mask be worn when handling material.
Costs [€/m²] Installed	:	Expensive
Other	:	

2.2 BACHL PUR/PIR ALU, Bachl – Thermal Insulation panels

Insulating panels for multiple applications. Main features:

- optimum thermal insulation properties
- high compressive strength
- clean and quick to process
- moisture resistant

Due to the low thermal conductivity of the material a good value of thermal protection can be obtained with relatively small insulation thicknesses. This property makes the product suitable for refurbishment where often space availability represents a problem.

Figure 2 BACHL PUR/PIR ALU, Thermal Insulation panels (source: http://www.bachl.de)

Manufacturer	:	Karl Bachl GmbH & Co.KG
Homepage	:	www.bachl.de
Product name	:	PUR/PIR ALU
URL:	:	http://www.bachl.de/index.php/purpir/bachl-pur-pir-fussboden/15-pur-fussboden/102-pur-pir-daemmplatten-alu
Fit for purpose	:	Insulation panel for multiple applications
Thermal conductivity	:	0,022 W/mK
Ease of use	:	Can be installed by common craftsmen
Availability	:	To be ordered from Ama Composites Srl .
Health /Safety	:	No special requirements
Costs [€/m²] Installed	:	
Other	:	

3 ThermalBridges

3.1 K1-PH, Dosteba – Shutter catch element

K1-PH is a thermal break fixation element that can be used to install external shading shutters reducing considerably the installation thermal bridge. It can be used in refurbishment and new projects. For refurbishments it can solve also the problem of the addition of an external shading element increasing the summer comfort and at the same time avoiding airtightness or thermal bridging issues.

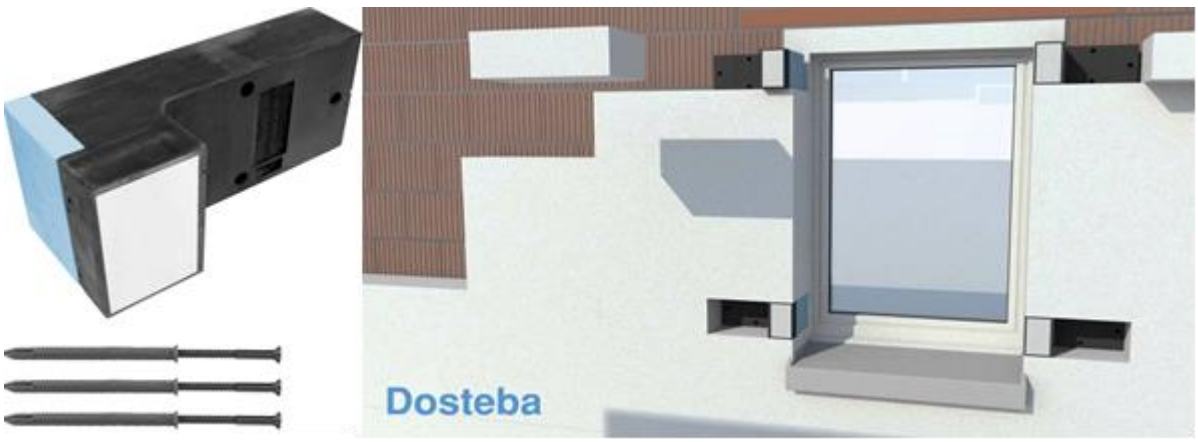


Figure 3 Dosteba K1-PH (Source, www.dosteba.de)

Manufacturer	:	Dosteba GmbH
Homepage	:	www.dosteba.de/
Product name	:	K1-PH
URL:	:	http://www.dosteba.de/c/3/universal-fixation-platebr-ump-alu-tri
Fit for purpose	:	Suitable for installation in building assemblies with EIFS
Ease of use	:	Can be installed by common craftsmen
Availability	:	To be ordered from Dosteba GmbH (http://www.dosteba.it/CustomContent/Details?systemName=Verkaufsgebiete)
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	

3.2 UMP®-ALU TRI, Dosteba – Universal fixation plate

UMP®-ALU is a thermal break fixation element that can be used to install heavy loads on the external facade such as awnings or stairs. It can be used in refurbishment and new projects.

Figure 4 Dosteba UMP®-ALU TRI (Source, www.dosteba.de)

Manufacturer	:	Dosteba GmbH
Homepage	:	www.dosteba.de/
Product name	:	UMP®-ALU TRI

URL:	:	http://www.dosteba.de/c/3/universal-fixation-platebr-ump-alu-tri
Fit for purpose	:	Suitable for installation in building assemblies with EIFS
Ease of use	:	Can be installed by common craftsmen
Availability	:	To be ordered from Dosteba GmbH (http://www.dosteba.it/CustomContent/Details?systemName=Verkaufsgebiete)
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	

4 Windows and doors

4.1 Null Fenster, Fanzola – Timber Window

Null Fenster is a high performance timber window suitable for cold, northern European climate. The most innovative feature of this window is the insulated blind frame that integrates perfectly with the window frame creating an external view where only the glazing element is visible. This results in a reduced need for maintenance and in an improved thermal performance of the window especially as regards the installation thermal bridge. Also on the bottom installation detail the frame is completely covered with insulation material, this is possible because the condensation drain is completely included within the insulated blind frame. This component is suitable both for new and refurbished buildings.

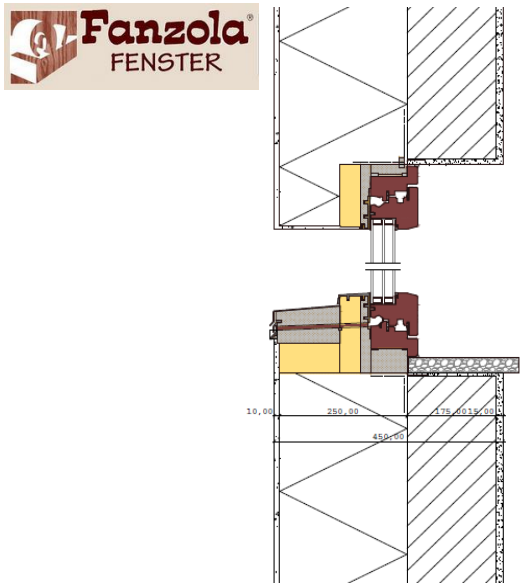


Figure 5 Null Fenster installation detail (Source: www.fanzola.it and www.passiv.de)

Manufacturer	:	Fanzola Marco & Giancarlo (S.N.C.)
Homepage	:	www.fanzola.it
Product name	:	Null Fenster
URL:	:	http://www.fanzola.it/NULL-FENSTER.html
U-Value Frame, bottom	:	0.58 W/(m²K)
U-Value Frame, side/top	:	0.57 W/(m²K)
Installation Thermal Bridge, bottom (on a typical Passivhaus wall, see picture above)	:	0.002 W/(mK)
Installation Thermal Bridge, side/top (on a typical Passivhaus wall, see picture above)	:	-0.006 W/(mK)
Fit for purpose	:	Component usable for different types of wall assembly
Ease of use	:	To be installed by qualified craftsmen
Availability	:	To be ordered from Fanzola S.N.C.
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	
Other	:	

4.2 Termoisolata Allumin, Estfeller – Insulated Trap Door

This Trap Door has been designed for buildings with high thermal quality. It ensures very good levels of thermal insulation, airtightness and acoustic protection. This component is suitable both for flat and pitched roofs. It is very useful for refurbishment projects where it is present an unheated attic that needs to be thermally separated from the thermal envelope but that still needs to be accessed.

Figure 6 Insulated Trap Door by Estfeller S.r.l. (source: http://www.estfeller.com/)

Manufacturer	:	Estfeller S.r.l.
Homepage	:	http://www.estfeller.com/
Product name	:	Retrattile Termoisolata, serie Allumin
URL:	:	http://www.estfeller.com/it/scale-retrattili/termoisolata/
U-Value Door	:	0.52 W/(m²K)
Fit for purpose	:	Component suitable for flat and pitched roofs
Ease of use	:	To be installed by qualified craftsmen
Availability	:	To be ordered from. Estfeller S.r.l.
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	
Other	:	

5 Airtightness

5.1 Rothoblaas – Products for airtight penetrations

Set of products that can be used to restore the airtight layer when this is interrupted by punctiform penetrations such as electric cables, sanitary pipes or ventilation ducts.

5.1.1 Rothoblaas, Manica Single

It is a sealing sleeve for pipes, consisting in an EPDM union and a butyl self-adhesive framesupported. It can be used for airtight sealing of sanitary pipes and ventilation ducts.

Figure 7 Rothoblaas, Manica Single (source: http://www.rothoblaas.com/it/it/home.html)

Manufacturer	:	Rotho Blaas srl
Homepage	:	http://www.rothoblaas.com/it/it/home.html
Product name	:	Manica Single
URL:	:	http://www.rothoblaas.com/it/it/prodotti/impermeabilizzazione/documentazione-tecnica.html#p.accessori
Fit for purpose	:	Suitable for application on synthetic and bituminous membranes, OSB panels or cross panelling.
Ease of use	:	To be installed preferably by craftsmen trained on airtightness basic principles
Availability	:	To be ordered from Rotho Blaas srl
Health /Safety	:	No special requirement

Costs [€/m²] Installed :

Other :

5.1.2 Rothoblaas, Manica Multi

It is a sealing sleeve for pipes, consisting in an EPDM union and a butyl self-adhesive framesupported. It can be used for airtight sealing up to 6 electric cables.

Figure 8 Rothoblaas, Manica Multi (source: http://www.rothoblaas.com/it/it/home.html)

Manufacturer	:	Rotho Blaas srl
Homepage	:	http://www.rothoblaas.com/it/it/home.html
Product name	:	Manica Multi
URL:	:	http://www.rothoblaas.com/it/it/prodotti/impermeabilizzazione/documentazione-tecnica.html#p.accessori
Fit for purpose	:	Suitable for application on synthetic and bituminous membranes, OSB panels or cross panelling.
Ease of use	:	To be installed preferably by craftsmen trained on airtightness basic principles
Availability	:	To be ordered from Rotho Blaas srl
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	
Other	:	

5.1.3 Rothoblaas, Manica Plaster

It is a sealing sleeve for pipes, consisting in an EPDM union and a butyl self-adhesive framesupported by a plasterable non-woven fabric. It can be used for airtight sealing of sanitary pipes and ventilation ducts.

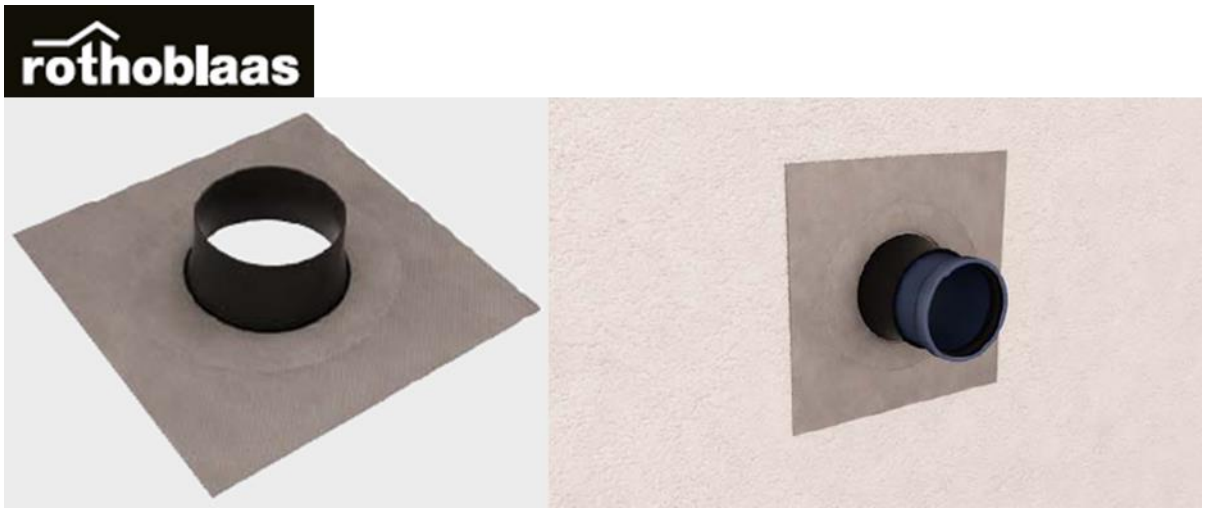


Figure 9 Rothoblaas, Manica Plaster (source: http://www.rothoblaas.com/it/it/home.html)

Manufacturer	:	Rotho Blaas srl
Homepage	:	http://www.rothoblaas.com/it/it/home.html
Product name	:	Manica Plaster
URL:	:	http://www.rothoblaas.com/it/it/prodotti/impermeabilizzazione/documentazione-tecnica.html#p.accessori
Fit for purpose	:	Suitable for application on wall where the airtight layer will be realized with the interior plaster.
Ease of use	:	To be installed preferably by craftsmen trained on airtightness basic principles
Availability	:	To be ordered from Rotho Blaas srl
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	
Othe	:	

5.1.4 Rothoblaas, Black Band

It is a butyl adhesive tape with high expansion capacity, made of a cold-applied self-adhesive butyl rubber compound. It is a sealant in compliance with DIN 4108/7 “airtightness of buildings”. Ideal for the sealing of membrane joints on irregular surfaces such as flexible or rigid piping, aluminum ventilation channels or vents, galvanized, polyethylene or PVC sheets.

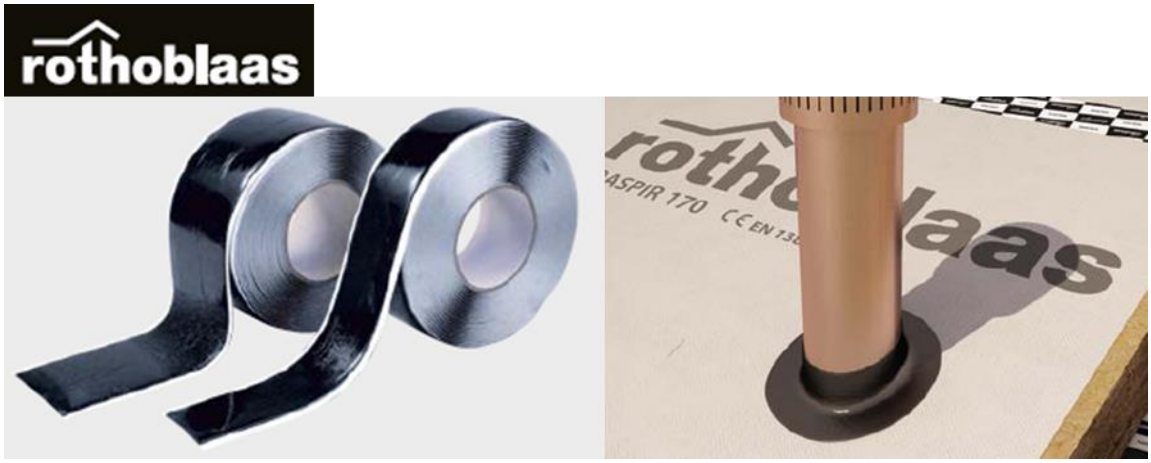


Figure 10 Rothoblaas, Black Band (source: http://www.rothoblaas.com/it/it/home.html)

Manufacturer	:	Rotho Blaas srl
Homepage	:	http://www.rothoblaas.com/it/it/home.html
Product name	:	Black Band
URL:	:	http://www.rothoblaas.com/it/it/prodotti/impermeabilizzazione/documentazione-tecnica.html#p.accessori
Fit for purpose	:	Ideal for the sealing of membrane joints on irregular surface such as flexible or rigid piping, aluminium ventilation channels or vents. galvanized, polyethylene or PVC sheets.
Ease of use	:	To be installed preferably by craftsmen trained on airtightness basic principles
Availability	:	To be ordered from Rotho Blaas srl
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	

6 Ventilation

6.1 ComfoAir 200, Zehnder – Centralized Ventilation Unit

It is a centralized ventilation unit with heat recovery. It is one of the ventilation units with higher heat recovery efficiency and it is suitable for small single-family building or for single zones of larger buildings. It fulfills all the Passivhaus requirements in terms of efficiency, comfort and indoor air quality. It can be installed vertically on a wall and horizontally within a dropped ceiling. This feature, together with its relatively small size make this product suitable also for retrofits..

Figure 11 ComfoAir 200, Centralized Ventilation Unit (source: www.zehnder.it)

Manufacturer	:	Zehnder
Homepage	:	www.zehnder.it
Product name	:	ComfoAir 200
URL:	:	http://www.zehnder.it/comfosystems/Schede-tecniche,189.html
Heat recovery	:	92 %
Electrical efficiency	:	about 0.42 W/(m³/h)
Installation pace	:	Quick Installation compared to a centralized ventilation unit
Fit to purpose	:	
Usability	:	To be installed by qualified craftsmen
Availability	:	To be ordered from Zehnder
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	

6.2 I-Tec IV40, Internorm - Windows Frame Integrated Ventilation

Ventilation unit with heat exchanger integrated in the window frame. It ensures room ventilation without window opening and without the installation of a conventional Passivhaus ventilation system with heat recovery. Very useful for refurbishment projects since it gives the possibility to save a lot of internal space and it shortens installation times. Compared to conventional Passivhaus ventilation units it has a lower heat recovery efficiency and a higher electrical absorption, therefore it is overall less efficient Filter quality is lower with respect to the one required by the Passivhaus standard. Variable air flow rates based on CO_2 or relative humidity levels it is not possible. The resulting ventilation strategy is less efficient compared with a conventional Passivhaus ventilation strategy with zoning.

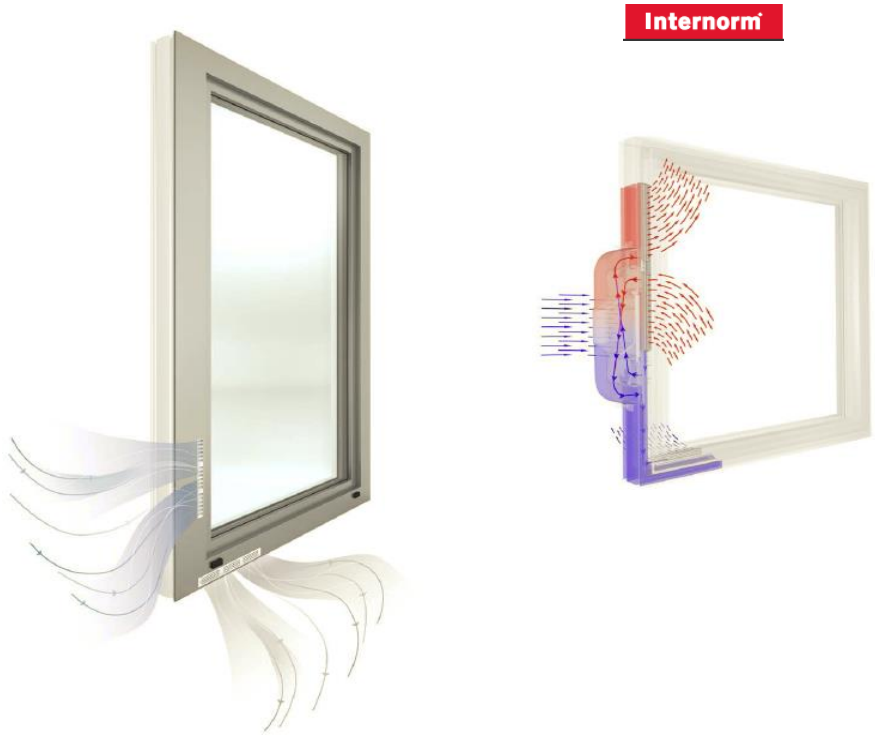


Figure 12 Internorm I-Tec IV40 (Source, www.internorm.com)

Manufacturer	:	Internorm
Homepage		www.internorm.com
Product name	:	I-Tec IV40
URL:	:	http://www.internorm.com/fileadmin/internorm/IT-it/Download/Allgemein/Ventilazione_VMC.pdf
Heat recovery	:	74 - 93 % (12% deduction for application to Passivhaus project)
Electrical efficiency	:	0.67 - 0.92 W/(m³/h)

Installation pace	:	Quick Installation, takes place together with the window
Fit for purpose	:	Can be integrated in Internorm PVC Windows
Usability	:	To be installed by qualified craftsmen
Availability	:	To be ordered from Internorm
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	
Other	:	

6.3 AIRFOX®, Beck+Heun – Insulated Blind Frame with integrated ventilation

Ventilation unit with heat exchanger integrated in the component ROKA-CO2MPACT®. Very useful for refurbishment projects since it avoids the installation of a conventional Passivhaus centralized ventilation system with heat recovery. The component ROKA-CO2MPACT® provides a ready-made solution for window installation (including thermal insulation, airtightness, sound proofing and shading system) even if its application in a refurbishment project might not be trivial since it requires a modification of the size of the existing window opening. Compared to conventional Passivhaus ventilation units it has a lower heat recovery efficiency and higher electrical absorption. The resulting ventilation strategy is less efficient compared with a conventional Passivhaus ventilation strategy with zoning.

Figure 13 AIRFOX®, Blind Frame Integrated Ventilation (Source: www.beck-heun.de)

Manufacturer	:	Beck+Heun
Homepage	:	www.beck-heun.de
Product name	:	AIRFOX®
URL:	:	www.top-air.it/wp-content/uploads/2015/04/AIRFOX_2015_IT.pdf

Heat recovery	:	about 85 % (12% deduction for application to Passivhaus project)
Electrical efficiency	:	about 0.5 W/(m³/h)
Installation pace	:	Quick Installation, takes place together with the window
Fit for purpose	:	Can be integrated in the component ROKA-CO_2MPACT®
Usability	:	To be installed by qualified craftsmen
Availability	:	To be ordered from Beck+Heun
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	
Other	:	

6.4 FreeAir 100, BluMartin – Decentralized ventilation Unit

Decentralized ventialation unit that can be installed in the building assembly. It is very useful for refurbishment projects since it avoids the installation of a conventional Passivhaus centralized ventilation system with heat recovery. It fulfils all the Passivhaus requirements in terms of heat recovery efficiency, sound and frost protection, electrical efficiency and filter quality. Variable air flow rates based on CO_2 or relative humidity levels it is possible. The resulting ventilation strategy is less efficient compared with a conventional centralized ventilation strategy with zoning.

Figure 14 FreeAir 100 ventilation unit (Source: www.blumartin.de)

Manufacturer	:	bluMartin
Homepage	:	www.blumartin.de
Product name	:	freeAir 100
URL:	:	http://www.blumartin.de/lueftungsgeraete/
Heat recovery	:	87 %
Electrical efficiency	:	about 0.26 W/(m³/h)
Installation pace	:	Quick Installation compared to a centralized ventilation unit
Fit for purpose	:	Can be installed in external walls of thickness ranging from 32 to 52 cm
Usability	:	To be installed by qualified craftsmen
Availability	:	To be ordered from bluMartin or local seller
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	
Other	:	

6.5 ComfoAir 70, Zehnder – Decentralized ventilation Unit

Decentralized ventialation unit that can be installed on the internal side of a perimetral wall. It is very useful for refurbishment projects since it avoids the installation of a conventional Passivhaus centralized ventilation system with heat recovery. It fulfils all the Passivhaus requirements in terms of heat recovery efficiency, frost protection, electrical efficiency and filter quality. It is recommended not to install this unit in bedrooms due to noise issues. Variable air flow rates based on CO_2 or relative humidity levels it is possible. The resulting ventilation strategy is less efficient compared with a conventional centralized ventilation strategy with zoning.

Figure 15 ComfoAir 70, decentralized Ventilation Unit (source: www.zehnder.it)

Manufacturer	:	Zehnder
Homepage	:	www.zehnder.it
Product name	:	ComfoAir 70
URL:	:	http://www.zehnder.it/comfosystems/Schede-tecniche,189.html
Heat recovery	:	85 %
Electrical efficiency	:	about 0.24 W/(m³/h)
Installation pace	:	Quick Installation compared to a centralized ventilation unit
Fit to purpose	:	
Usability	:	To be installed by qualified craftsmen
Availability	:	To be ordered from Zehnder
Health /Safety	:	No special requirement
Costs [€/m²] Installed	:	

7 Products for summer comfort

7.1 HV350, Internorm - Windows with integrated blind

Windows with blinds integrated into the window glazing. Very useful for refurbishment projects since it avoids the installation of an external shading device. If a shading device is not present in the existing window it gives the possibility to add it without changing the size of the window opening and without a considerable extra effort. If a shading device is present in the existing window this product can still be used getting read of the existing shutter box, which is typically a source of problems as regards thermal bridging and airtightness. The performance of the glazing is reduced, in the sense that one needs an extra glazing pane to reach the same performance that would have been reached without the integrated shading device. Furthermore the g value of the glazing is lower and this reduces the solar gains in winter periods.

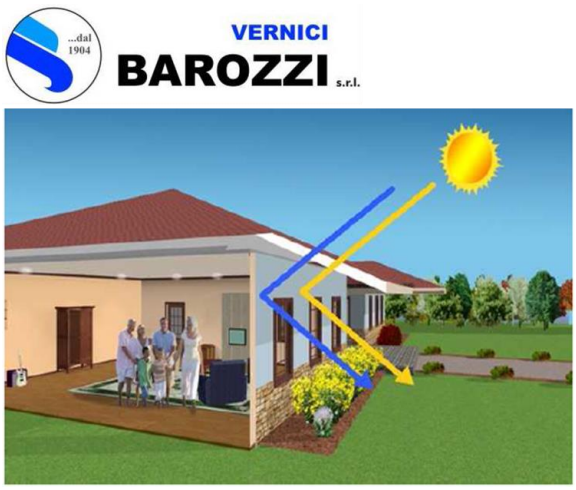
Figure 16 HV350 Internorm, windows with integrated blind

Manufacturer	:	Internorm
Homepage	:	www.internorm.com
Product name	:	HV350
URL:	:	http://www.internorm.com/it/prodotti/home-pure/home-pure-fenster/legnoalluminio/system/show/System/hv-350-1.html
U_f	:	0.86 W/m²K
U_g	:	0.5 - 0.7 W/m²K with quadruple glazing, 0.9 W/m²K with triple glazing
Installation pace	:	Quick Installation of the shading system which is already integrated in the glazing element
Fit to purpose	:	Product integrated in timber-aluminium windows
Usability	:	To be installed by qualified craftsmen.
Availability	:	To be ordered from Internorm
Health /Safety	:	No special requirements
Costs [€/m²] Installed	:	
Other	:	

7.1 NanoTECH-line, Barozzi - Thermoinsulating and thermoreflective painting solutions

Thermoinsulating and thermoreflective painting solutions. For highly insulated thermal envelopes these products have shown to increase the thermal performance of the building especially in extremely warm climates. This is due to a dramatic reduction of the absorptivity of the external walls. This product it is suitable also for refurbishment projects.

…



Manufacturer	:	Vernici Barozzi srl
Homepage	:	http://www.barozzivernici.it/
Product name	:	NanoTECH-line
URL:	:	http://www.internorm.com/it/prodotti/home-pure/home-pure-fenster/legnoalluminio/system/show/System/hv-350-1.html
Solar Reflectance	:	0.84
Solar Reflex Index SRI	:	106
Fit to purpose	:	To be used especially in extremely warm climates
Usability	:	Can be installed by qualified craftsmen.
Availability	:	To be ordered from Vernici Barozzi srl
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	