

D3.8_Evaluate Specialist Deep-Retrofit Products Report

Bulgaria

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



Co-funded by the Intelligent Energy Europe
Programme of the European Union

Technical References

Project Acronym	EuroPHit
Project Title	Improving the energy performance of step-by-step refurbishment and integration of renewable energies
Project Coordinator	Jan Steiger Passive House Institute, Dr. Wolfgang Feist Rheinstrasse 44/46 D 64283 Darmstadt jan.steiger@passiv.de
Project Duration	1 April 2013 – 31 March 2016 (36 Months)

Deliverable No.	D3.8
Dissemination Level	PU
Work Package	WP3_Practical Implementation and Construction Teams
Lead beneficiary	04_MosArt
Contributing beneficiary(ies)	09_EnEffect Group
Author(s)	Iglika Lutzkanova
Co-author(s)	Dimitar Doucov
Date	25.03 2015
File Name	EuroPHit_D3.8_ 20150325_EnEffect.doc

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Table of contents

Abstract.....	4
1 Introduction.....	5
1.1 General project description.....	5
1.2 Scope of this report	5
2 Building envelope	6
2.1 Insulations.....	6
2.1.1 Polyurethane Spray Foam	6
2.1.2 Cellulose from recycled paper.....	8
2.1.3 Austrotherm EPS 150-PLUS Insulation above rafters.....	10
2.1.4 Decoration profiles from EPS	11
2.1.5 Austrotherm EPS 150-PLUS - for roofs	12
2.1.6 PREMIUM FILZ.....	13
2.1.7 Internal PUR rigid foam panels.....	14
2.1.8 Austrotherm EPS F-PLUS - facades.....	15
2.2 Doors and windows	16
2.2.1 Aluminium door	16
2.2.2 Aluminium windows.....	16
2.2.3 PVC windows - Schüco Corona Alu Inside	18
2.2.4 PVC windows - GENE0 PHZ	19
3 Special products avoiding thermal bridges (e.g. floor, windows, etc.)	20
3.1 Kleberanker - PDBL_StarTrack_red	20
3.2 STR U Baunit Rondelle EPS für STR U	21
4 Ventilation.....	22
4.1 Schüco VentoTherm.....	22
4.2 ECO ROOM 150/600 12 V heat recovery unit	24
4.3 Helios EcoVent KWL EC 60 Eco.....	25
4.4 Wall mounted recuperator.....	26
5 Heating, cooling and domestic hot water generation and distribution	26
5.1 Recuperator with heat pump for centralized ventilation	27
6 Final remarks	28

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 - CS10, Primary school "St.St Kiril and Methodius", Gabrovo

The building is constructed in 1970. It has concrete structure with external brick walls (25 cm.) and concrete slabs. The roof is flat double roof with ventilated space between the two slabs. The hydro insulation of the roof is in poor condition. There is no any thermal insulation. The fully heated basement (blocks B, C and D) is partially below the ground level. The windows in whole building have been replaced in 2005 with PVC ($U=2.2 \text{ W/m}^2\text{K}$) and aluminium (in the gym, $U=2.2 \text{ W/m}^2\text{K}$) with double glazing with white float glass 4/20/4mm. Since 2013, the school is connected to the central gas heating.

Six hundred and forty children are studying in this school on two shifts and seventy six people personal takes care of them. The TFA of the building is 7312m^2 .

The whole refurbishment of the building will provide the needed measures for reaching the hygienic standard (toilets, dressing rooms), standard for access for disabled, (new lift, rails on stairs)

The deep energy efficiency retrofit will consists of:

- ROOF insulation
- external WALL INSULATION – mounting EPS with graphite insulation on the walls, shading of the existing windows in East and West facades, reduction of the radiators, improving of the airtightness, VENTILATION with heat recovery, solar panels for DHW
- External underground walls insulation, perimeter insulation, insulation above the ground floor slab in the Gym.

NEXT STEP – Replacement of WINDOWS: The PVC windows will be replaced in 10 years, when they will be 20 years old. The aluminium windows will be replaced in 20 years, when they will be 30 years old.

1.2 Scope of this report

The scope of this report is to describe the new products available on Bulgarian market, that are suitable for deep retrofit. Some of them will be used in the Case study projects.

The products are evaluated, regarding the following criteria:

- 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.

2 Building envelope

2.1 Insulations

2.1.1 Polyurethane Spray Foam

Thermal insulation. Very good for retrofit. Spray technology makes polyurethane especially useful in places with difficult access and with unusual forms. Very good adhesion and elasticity-could be used above the old hydro insulation. One of the advantages is that it makes one continuous layer without interruptions.

The distributors advertise the Polyurethane as thermal and hydro insulation, but the practice shows that separate polyurethane hydro insulation is better to be considered. When it is used on foundations, cracks from the subsidence of the building in time may appear. The absence of elasticity of the polyurethane may lead to cracks on the roofs, due to different thermal swelling of the materials and also cracks between the insulation and construction elements (like beams), which allow some movement.

Manufacturer	:	BASF and others.	
Homepage	:	http://www.basf.bg/ecp2/Business_Segments_bulgaria/Polyurethanes	
Product name	:	Polyuretan sprej foam	
URL:	:	http://polyurethane.bg/bg/foam-application/1-foam-applications/7- http://aginvest.org/web/index.php/bulgarian/about/services/pur_01/bases http://www.en-impex.com/index.html	
Fit for purpose	:	Foundations, Roof insulation, Walls	
λ D: W/(mK)	:	0,028	
Installation pace	:	Quickly, but needs time to achieve the necessary thickness in layers.	
Preconditions	:	.	Very useful!
Usability	:	Can be installed only by specialized firms with spray machines.	
Availability	:	Available in Bulgaria	
Health /Safety	:	Very good cover without thermal bridges	
Costs material [€/m ²]	:	95 €/m ³	
Other	:		



2.1.2 Cellulose from recycled paper

THERMOFLOC is a premium cellulose based insulation material made from unmixed newspaper. Blowing technology refers to a process by which the insulation material is installed by means of specially equipped machines into the building components. The insulation is pumped into hoses and transported further into the hollow spaces where it is compressed. There, the insulation material spreads out over the entire space and is compressed by pressure generating an uninterrupted and continuous insulation layer.

Manufacturer	:	TermoFloc	
Homepage	:	http://www.thermofloc.com/en	
Product name	:	TermoFloc - celulo	
URL:	:	http://www.varnaplast.com/Thermoflok_catalog_Bulgarian.pdf http://www.varnaplast.com/en/experto.html	
Fit for purpose	:	floor, wall and roof applications	
λ D: W/(mK)	:	0,039	
	:		
Installation pace	:	Very quickly with blowing machines	
Preconditions	:		Very useful!
Usability	:	Can be installed by specialized firms with blow machines.	
Availability	:	Available in Bulgaria	
Health /Safety	:	Eco product - 100 % organic-made from recycled paper	
Costs Installed [€/m ²]	:		
Other	:		

THERMOFLOC в България

THERMOFLOC®
ИЗОЛАЦИЯ ОТ ЦЕЛУЛОЗА



Монтаж в подпокривно пространство на къща
гр. Плевен



Монтаж в таван над конструкция
гр. Плевен



Монтаж в таван над конструкция
Ваканционно селище "Топола скайс"
до гр. Каварна

THERMOFLOC®
ИЗОЛАЦИЯ ОТ ЦЕЛУЛОЗА

THERMOFLOC в България



Монтаж в подпокривно пространство
гр. Банско



Монтаж в таван над конструкция
гр. София



Монтаж в стенна обшивка
гр. Банско



Монтаж в подпокривно пространство
гр. Варна

2.1.3 Austrotherm EPS 150-PLUS Insulation above rafters

Thermal insulation above rafters - reduces thermal bridges. Useful also in retrofits.

Manufacturer	:	Austrotherm	
Homepage	:	http:// www.austrotherm.bg	
Product name	:	Austrotherm EPS 150-PLUS - above rafters	
URL:	:	http://www.austrotherm.bg/produkti/austrotherm-eps/austrotherm-eps-150-plus-izolaciya-vrkhu-gredi-.html	
Fit for purpose	:	Roof insulation above rafters	
λ_D : W/(mK)	:	0,030	
Installation pace	:	quickly	
Preconditions	:		
Usability	:	Can be installed by common builder	
Availability	:	Produced from AustroTherm Bulgaria	
Health /Safety	:	No thermal bridges	
Costs material [€/m ³]	:	60€/m ³	
Other	:		

Austrotherm EPS® 150-PLUS Изоляция върху греди

Специално върху греди, за предотвратяване на термомостове, при изолация на покриви със стопанска цел и при саниране. Топлопроводимост: 0.030 W/(mK)



Предимства:

- ▶ Стабилна форма
- ▶ Водоотблъскващ ефект
- ▶ Отлични екологични качества
- ▶ Широкоплочен формат

2.1.4 Decoration profiles from EPS

Manufacturer	:	Austrotherm	
Homepage	:	http:// www.austrotherm.bg	
Product name	:	Window frames, sills, pilasters from EPS	
URL:	:	http://www.austrotherm.bg/produkti/austrotherm-fasadni-profil/podprozorechni-i-obkantvashhi-profil-ot-eps.html	
Fit for purpose	:	Decoration of the window frames and sills	
λ D: W/(mK)	:	0,031	
Installation pace	:	Quickly	
Preconditions	:		
Usability	:	Can be installed by common builder	
Availability	:	To be ordered from AustroTherm Bulgaria	
Health /Safety	:	No thermal bridges	
Costs material [€/m ²]	:	20-60 Euro/m	
Other	:		

Подprozorechni и обкантвачи профили от EPS

Придайте завършеност на Вашата фасада!

Декоративните подprozorechni елементи от EPS, образуват важно допълнение към рамкирането на прозореца в областта на перваза. Те могат да бъдат използвани и като обкантвачи профили, с които да се постигне оптично разделение на пространството при сгради с големи височини на етажите.

Подprozorechnите и обкантвачи профили от EPS придават завършеност на оформлението на фасадата, като осигуряват и допълнителна топлоизолация.



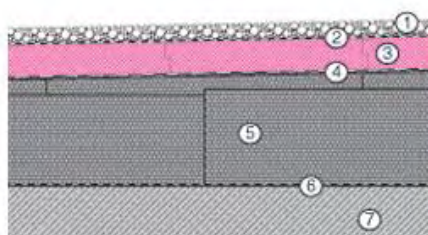
2.1.5 Austrotherm EPS 150-PLUS - for roofs

The inclination helps to reduce the load on the roof. Good thermal conductivity.

Manufacturer	:	Austrotherm	
Homepage	:	http:// www.austrotherm.bg	
Product name	:	Austrotherm EPS 150-PLUS	
URL:	:	http://www.austrotherm.bg/produkti/austrotherm-eps/austrotherm-eps-150-plus-grafitna-toploizolacionna-plocha.html	
Fit for purpose	:	Roof insulation with inclination. No need for heavy screeding for inclination.	
λ D: W/(mK)	:	0,030	
Installation pace	:	Easy -	
Preconditions	:	Suitable on all kinds of wall constructions	
Usability	:	Can be installed by common builders	
Availability	:	Produced from AustroTherm Bulgaria	
Health /Safety	:		
Costs material [€/m ²]	:	70€/m ³	
Other	:		

Продукти:

- Austrotherm EPS 100-PLUS
- Austrotherm EPS 120-PLUS
- Austrotherm EPS 150-PLUS



- 1 Посипка - слой от чакъл (16/32)
- 2 Филтрираща/защитна мембрана
- 3 Austrotherm XPS TOP 30
- 4 Хидроизолация
- 5 Austrotherm EPS-PLUS Наклонен покрив
- 6 Пароизолационен и пародренажен слой за компенсиране налягането на парата
- 7 Стоманобетонена плоча

Austrotherm EPS Наклонен покрив-PLUS

Устойчива на натиск графитна топлоизолационна плоча с наклон от експандиран полистирол

намаляване теглото на покрива, образуване на наклон за безпроблемно отводняване на покрива, избягване на термомостове, широкоплочен формат

Аустротерм предлага:

- безупречна покривна отводняваща система
- детайлиран план за полагане
- последователно номериране на доставените плочи
- подробен списък на частите
- доставка до строителната площадка



2.1.6 PREMIUM FILZ

Glass mineral wool

Manufacturer	:	Isover	
Homepage	:	www.isover.com	
Product name	:	Premium Filz	
URL:	:	http://www.isover.bg/product/Produkti/PREMIUM-FILZ/node/111/subnode/602/	
Fit for purpose	:	Roof insulation , glass wool	
λ D: W/(mK)	:	0,032	
Installation pace	:	normal	
Preconditions	:		Very useful!
Usability	:	Can be installed by common builder	
Availability	:	Available on market, imported from Isover.	
Health /Safety	:		
Costs material [€/m ²]	:	25 €/m ³	
Other	:		



2.1.7 Internal PUR rigid foam panels

Remmers iQ-Therm 50 combines capillarity, thermal insulation and regulation of humidity in one system. To realise these multifunctional requirements, holes in regular intervals perpendicular to the surface are made in highly thermal insulating, polyurethane foam panels. These holes are filled at the factory with a special, highly capillary-active, mineral material. The panels are attached to the surface of the interior wall with iQF fix and a layer of render, iQ-Top, is applied 10 to 15 mm thick as absorption layer.

Manufacturer	:	Remmers	
Homepage	:	http://www.remmers.de/	
Product name	:	Remmers iQ-Therm 50	
URL:	:	http://www.remmers.de/4173.0.html http://www.bg.remmers.com/76+M55be7178757.0.html http://www.bg.remmers.com/fileadmin/dam/produkte/tm/TM1_0242_EN.pdf	
Fit for purpose	:	Internal wall insulation	
λ_D : W/(mK)	:	0,031	
Installation pace	:	easy	
Preconditions	:	not	
Usability	:	Can be installed by common builder	
Availability	:	Imported from a local representative	
Health /Safety	:	Regulates humidity	
Costs material [€/m ²]	:	Prices on demand	expensive
Other	:		



2.1.8 Austrotherm EPS F-PLUS - facades

Manufacturer	:	Austrotherm	
Homepage	:	http:// www.austrotherm.bg	
Product name	:	Austrotherm EPS F-PLUS EPS NEO	
URL:	:	http://www.austrotherm.bg/produkti/austrotherm-eps/austrotherm-eps-f-plus-fasadna-grafitna-toploizolacionna-plocha.html http://plastimo.bg/plastimoeps/features.htm	
Fit for purpose	:	External insulation of the facade (WDVS)	
λ_D : W/(mK)	:	0,031	
Installation pace	:	Very quickly	
Preconditions	:	Suitable on all kinds of wall constructions	Very useful!
Usability	:	Can be installed by common builders	
Availability	:	Produced in Austrotherm Bulgaria.	
Health /Safety	:		
Costs [€/m ³]	:	50€/m ³	
Other	:		

Austrotherm EPS F-PLUS Фасадна графитна топлоизолационна плоча

Графитна фасадна топлоизолационна плоча от експандиран полистирол с повишени топлоизолационни свойства

- ▶ отлични топлоизолационни свойства
- ▶ стабилна форма и лесна обработка
- ▶ не поглъща вода
- ▶ не съдържа вредни за околната среда и здравето компоненти

Приложение:

Фасадна топлоизолация в комбинирана топлоизолационна система (WDVS)

Свойства:

- ▶ Съдържание на клетката: Въздух
- ▶ Тип продукт: EPS F съгласно EN 13499 и ETAG 004
- ▶ Кант: прав кант (GK), възможност за Оформяне на кант
- ▶ Маркировка: EPS® F+
- ▶ Площ: 0,5 m² на плоча
- ▶ Якост на опън: 150 kPa
- ▶ Теплопроводимост: λ_D : 0,031 W/(mK)
- ▶ Клас по реакция на огън: E



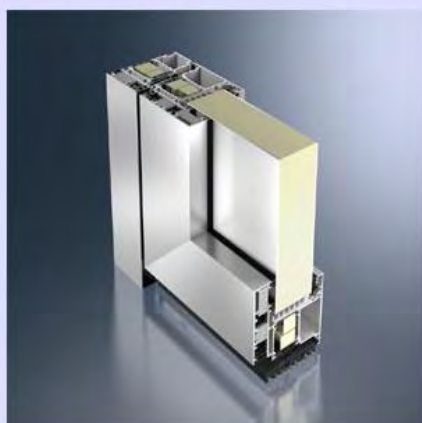
2.2 Doors and windows

2.2.1 Aluminium door

For energy-saving Schüco entrance doors, a thermally insulated door threshold forms the seal with the floor.

Manufacturer	:	Schüco	
Homepage	:	http://www.schueco.com/web2/com	
Product name	:	Schüco ADS 112 IC	
URL:	:	http://www.alukoenigstahl.com/AKS/portal/alias__Stahl/lang__bg-BG/domain__bg/tabID__4538/DesktopDefault.aspx http://www1.alukoenigstahl.com/AKS/portal/alias__Stahl/lang__bg-BG/domain__bg/tabID__4538/DesktopDefault.aspx	
Fit for purpose	:	doors	
	:	The SI system (Super Insulation) sets new standards with excellent Ud values of 0.74 W(m ² K).	
Installation pace	:	normal	
Preconditions	:		
Usability	:	Can be installed by door producers.	
Availability	:	Local producers of the windows. Imported profile.	
Health /Safety	:		
Costs Installed [€/m ²]	:	Prices on demand	
Other	:		

Schüco ADS 112.IC



предимства на системата

2.2.2 Aluminium windows

The Schüco AWS 112.IC (Insulation Cover) aluminium window system is the first aluminium window system in the world which meets the stringent criteria of passive house certification. It offers a comfortable room climate through exceptional thermal insulation and an attractive design.

Unique thermal insulation: U_f value = 0.8 W/(m²K)

Passive house-certified

Manufacturer	:	Schüco	
Homepage	:	http://www.schueco.com/web2/com	
Product name	:	The Schüco AWS 112.IC	
URL:	:	http://www.schueco.com/web2/de-en/home_owners/products/windows/features?fragment=Accordion-energieeffizient#Accordion-energieeffizient http://www.alukoenigstahl.com/AKS/portal/alias_Stahl/lang_bg-BG/domain_bg/tabID_4531/DesktopDefault.aspx	
Fit for purpose	:	windows	
	:	$U_f \leq 0,8$ W/m ² K	
Installation pace	:	normal	
Preconditions	:		
Usability	:	Can be installed by producers of the windows.	
Availability	:	Local producers of the windows. Imported profile.	
Health /Safety	:		
Costs Installed [€/m ²]	:	Expensive for local market	
Other	:		



Schüco AWS 112.IC предимства на системата

Schüco AWS 112 IC е първият в света алуминиев прозорец, изпълняващ критерия за топлоизолация от $U_f \leq 0,8$ W/m²K на института по сертифициране на строителни конструктивни елементи за пасивни сгради – "Dr. Wolfgang Feist"

2.2.3 PVC windows - Schüco Corona Alu Inside

PVC profile, supported with aluminium core.

Manufacturer	:	Schüco	
Homepage	:	http://www.schueco.com/web2/com	
Product name	:	Schüco Corona Alu Inside	
URL:	:	http://www.schueco.com/web2/de-en/home_owners/products/windows/features?fragment=Accordion-energieeffizient#Accordion-energieeffizient http://www.alukoenigstahl.com/AKS/portal/alias___Stahl/lang_bg-BG/domain_bg/tabID_4536/DesktopDefault.aspx	
Fit for purpose	:	windows	
	:	$U_f \leq 0,76 \text{ W/(m}^2\text{K)}$	
Installation pace	:	normal	
Preconditions	:		
Usability	:	Can be installed by producers of the windows.	
Availability	:	Local producers of the windows. Imported profile.	
Health /Safety	:		
Costs Installed	€/m ² :	App. 240 €/m ² , the exact prices on demand.	
Other	:		

Със седем камерната профилна система се постига много висок коефициент на топлоизолация, недостижим до този момент без допълнителни мерки. Патентованата съставна технология алуминий - пластмаса, в сравнение с конвенционалните профили, значително укрепва конструкцията на пластмасовия профил, така че може да бъде избегната стоманената армировка. Отстраняването на този мост за преминаване на топлина повишава значително изолационните стойности на профилите. При смяната на прозорци с новите енергооптимизирани прозорци Schüco ThermoPlus намаляват се до 33% енергийната си нужда. В една еднофамилна къща може да се спести до 1.441 литра гориво за отопление на година. Едновременно с това спестяваме на околната среда около 4.546 кг въглероден диоксид на година. Освен с иновативната си профилна технология, енергоспестяващия прозорец Schüco ThermoPlus ви предлага предимства като висока шумоизолация и устойчивост на атмосферни влияния, благодарение на наличието на три независими уплътнителни камери. Отличните стойности на топлоизолация правят енергооптимизирания прозорец Schüco ThermoPlus изключителен. Той допринася за чувството на уют като не позволява понижаването на температурата от външната страна на рамката при настъпване на зимата да бъде усетено в помещението. По този начин значително се намалява появата на влага и конденз. Специално внимание се отделя на сигурността: енергооптимизирания прозорец Schüco ThermoPlus предлага висока устойчивост на материала и строителна дълбочина от 82 mm с вграден обков. Въпреки отличните топлоизолационни качества профилът остава елегантен и тънък и позволява навлизането на светлина в помещението. При ново строителство с енергооптимизирания Schüco ThermoPlus вие може да проектирате своите прозорци още по-просторни и светли.



Schüco Corona Alu Inside предимства на системата

2.2.4 PVC windows - GENE0 PHZ

Certified PH window

Manufacturer	:	Rechau	
Homepage	:	http://www.rechau.com	
Product name	:	GENEO PHZ	
URL:	:	http://www.rechau.com/bg-bg/stroitelstvo/%D0%BF%D1%80%D0%BE%D0%B7%D0%BE%D1%80%D0%B5%D1%87%D0%BD%D0%B8-%D0%B8-%D1%84%D0%B0%D1%81%D0%B0%D0%B4%D0%BD%D0%B8-%D1%81%D0%B8%D1%81%D1%82%D0%B5%D0%BC%D0%B8/fenstersysteme/geneo-phz http://www.rechau.com/at-de/bau/fensterfassaden/fenstersysteme/fenster-geneo-phz	
Fit for purpose	:	windows	
	:	$U_f \leq 0,79 \text{ W/(m}^2\text{K)}$	
Installation pace	:	normal	
Preconditions	:		
Usability	:	Can be installed by producers of the windows.	
Availability	:	Local producers of the windows. Imported profile.	
Health /Safety	:		
Costs Installed [€/m ²]	:	App. 205 €/m ² , the exact prices on demand.	
Other	:		



3 Special products avoiding thermal bridges (e.g. floor, windows, etc.)

3.1 Kleberanker - PDBL_StarTrack_red

Adhesive anchor on which you stick the insulation. Could be used above existing insulation to add a new one. Replaces the dubels and reduces thermal bridges.

Manufacturer	:	Baumit	
Homepage	:	http:// www.baumit.bg	
Product name	:	Kleberanker - PDBL_StarTrack_red	
URL:	:	http://www.baumit.bg/pimdab/BG/pdb/PDBL_StarTrack_red.pdf http://www.baumit.bg/startrack/	
Fit for purpose	:	Installing EPS insulation on the walls without dubels and thermal bridges.	
$\lambda D: W/(mK)$:		
Installation pace	:	quickly	
Preconditions	:	Massive walls	
Usability	:	Can be installed by common builder	
Availability	:	Imported from Baumit.	
Health /Safety	:	No thermal bridges	
Costs Installed	[(€/m ²) :]	0.7 €/unit 4.2€ /m ²	
Other	:	Less expensive then metal dubel.	

Залепващ анкер на Баумит



Анкерът се закрепва в носещата стена посредством щифт преди залепянето на топлоизолационната плоча като образува допълнителни точки за по-здраво прилепване. Вместо досега необходимите 6 дюбела на m² топлоизолация за закрепването към стената, сега Austrotherm EPS® се залепва върху 6 залепващи анкера на m² за плоскост.

- ▶ спестява енергия и разходи
- ▶ никакви термомостове
- ▶ никакви следи от дюбели

• Сроковете на доставка се договарят при поръчка

3.2 STR U Baunit Rondelle EPS für STR U

The rondelle covers the dubel in thermal insulation system and reduces the thermal bridge. It should be bigger thickness, to cover the PH requirements.

Manufacturer	:	Baunit	
Homepage	:	http:// www.baunit.bg	
Product name	:	Рондела от EPS за дюбел STR U Baunit Rondelle EPS für STR U	
URL:	:	http://www.baunit.bg/pimdam/BG/pdb/PDBL_Dubel_Rondelle-STR_U.pdf	
Fit for purpose	:	covers the dubel and reduces thermal bridge	
λ D: W/(mK)	:	0,04	
	:		
Installation pace	:	With special instruments, delivered from Baunit.	
Preconditions	:		
Usability	:	Can be installed by common builders.	
Availability	:	Imported from Baunit.	
Health /Safety	:	No thermakl bridges	
Costs [€/unit]	:	0.06 €/unit	
Installed	:	0,36€ /m2	
Other	:	To be invented with bigger thickness	



Baunit Rondelle EPS STR U

(Баунит Рондела от EPS за дюбел STR U)

Капачка от изолационен материал с конична форма за по-добро сцепление с топлоизолационната плоскост.

Диаметър: 65 мм/ дебелина: 15 мм

EPS ($\lambda = 0,040$ W/mK)
Кашон 100 бр.

10,00/100 бр.
0,10/бр.

12,00/100 бр.
0,12/бр.



4 Ventilation

4.1 Schüco VentoTherm

Ventilation equipment for aluminium and plastic windows, the decentralised ventilation . With the assistance of sensor management, the ventilation ideally adjusts to the preset values for the CO₂ content or humidity. Ventilation equipment from Schüco works almost noiselessly and requires very little space.

Manufacturer	:	Schüco	
Homepage	:	http://www.schueco.com/web2/com	
Product name	:	Schüco VentoTherm	
URL:	:	http://www.alukoenigstahl.com/AKS/UI/AKSImage.aspx?TabID=0&Alias=Stahl&Lang=bg-BG&Domain=bg&ec=1&imageID=703ddad0-7751-4f83-9822-15e4dfa1aa48 page 24 http://www.alukoenigstahl.com/AKS/portal/alias_Stahl/lang_bg-BG/domain_bg/tabID_4442/DesktopDefault.aspx http://www.dogrami.bg/php/statiq.php?id=308	
Fit for purpose	:	Decentralized ventilation through windows	
λD: W/(mK)	:	45 % heat recovery - not good enough for PH Energy consumption - 5 W -13W Air flow - 15-30 m ³ /h	
Installation pace	:	normal	
Preconditions	:		
Usability	:	Should be installed by firms, delivering the windows.	
Availability	:	Available on the local market.	
Health /Safety	:	Highly effective external air filters, allergenic pollen and insects no longer enter the building when the windows are closed. Since windows can remain closed, the security risk is reduced. Noise insulation is also taken care of; depending on the glazing, minimal noise insulation values are possible.	
Costs Installed [€/m ²]	:	Not very expensive - if you compare with the price of the other decentralized ventilation. Prices on demand.	
Other	:		

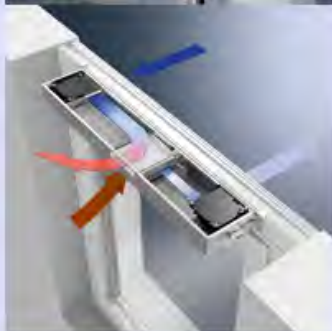


Schüco VentoTherm

Интегрирана в прозореца вентилационна система



Schüco VentoTherm предимства на системата



SCHÜCO Vento Therm - система, интегрирана в прозореца за отвеждане и приток на въздух с въздушен филтър, рекуперация(възвръщане) с топлинно възстановяване и сензорно управление. До 35 % икономия на енергия чрез степен на затопляне на входящия въздух до 45 %. Намалява енергийните загуби. Възможност за филтриране на входящия въздух чрез полено филтър. Осигуряване на постоянен въздушен обмен. Запазени са всички функции на затворен прозорец, по отношение на защита срещу взлом и шум, без да има недостатъците на отворения прозорец, като навлизане на прах, шум, инсекти и др.

4.2 ECO ROOM 150/600 12 V heat recovery unit

Energy efficient, through-the-wall mini ventilation unit called a Single Room Heat Recovery unit (SRHR) for mounting through external walls in WCs, kitchens, bathrooms and utility rooms, to either replace existing extract fans or for new installations.

Manufacturer	:	Soler & palau	
Homepage	:	http://www.solerpalau.com/	
Product name	:	ECO ROOM 150/600 12 V heat recovery unit	
URL:	:	file:///D:/Desktop/Downloads/ECOROOM.pdf http://www.elektrodesign.sk/web/en/product/eco-room-150-600-12-v-heat-recovery-unit http://www.envirovent.com/trade/products/single-room-heat-recovery/heatsava/	
Fit for purpose	:	Decentralized ventilation through walls per room	
Air flow	:	25M3/h, 75 % RECOUPARATION	
Installation pace	:	easy	
Preconditions	:		
Usability	:	Could be installed from the owner.	
Availability	:	Not available on the local market. Should be ordered and delivered.	
Health /Safety	:	Highly effective air filters. Noise insulation is also taken care of.	
Costs Installed [€/m ²]	:	536 Euro+delivery	
Other	:	Not local representative, problem with service	



4.3 Helios EcoVent KWL EC 60 Eco

Energy efficient, through-the-wall ventilation unit, very useful for retrofits.

Manufacturer	:	Helios Ventilation System	
Homepage	:	http://www.heliosfans.co.uk/	
Product name	:	Helios EcoVent KWL EC 60 Eco	
URL:	:	http://www.heliosfans.co.uk/katalog/pdf/maincatalogue_074_099_heat_recovery.pdf page 78 http://shop.jilishta.com/recuperator/289--helios-ecovent-kwl-ec-60-eco.html	
Fit for purpose	:	Decentralized ventilation through walls per room	
Air flow	:	60M3/h, 70 % RECOUPARATION	
Installation pace	:	easy	
Preconditions	:		
Usability	:	Could be installed from the owner.	
Availability	:	Available on local market - imported.	
Health /Safety	:	Highly effective air filters. Noise insulation is also taken care of.	
Costs Installed	€/m ² :	1 230Euro	
Other	:	Local service.	



4.4 Wall mounted recuperator

Particularly suitable for modern homes with high insulation, which require ventilation to remove stale air without major heat loss

Manufacturer	:	Mitsubishi Electronic	
Homepage	:	http://www.mitsubishielectric.com/	
Product name	:	Mitsubishi VL100E5	
URL:	:	http://climacom.com/products/item/605	
Fit for purpose	:	Decentralized ventilation	
Air flow	:	60-105M3/h, 73-80 % RECOUPARATION	
Installation pace	:	easy	
Preconditions	:		
Usability	:	Could be installed from the owner.	
Availability	:	Available on local market - imported.	
Health /Safety	:	Ventilation reduces mold.	
Costs Installed [€/m²]	:	380Euro	Low price
Other	:	Local service.	



5 Heating, cooling and domestic hot water generation and distribution

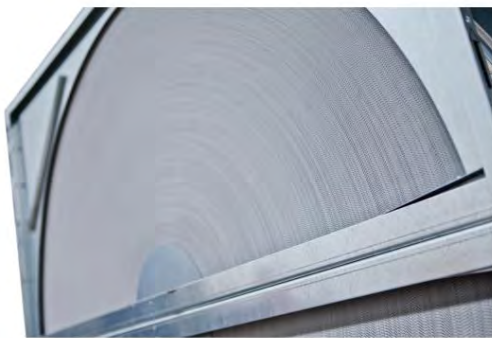
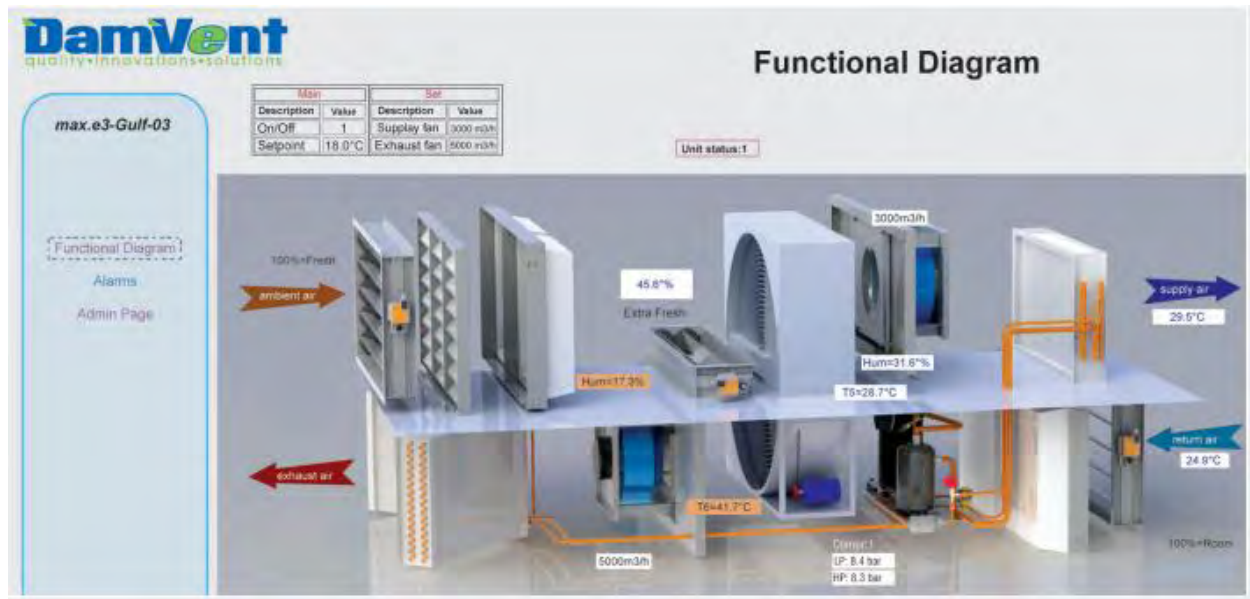
5.1 Recouperator with heat pump for cenralized ventilation

Recovering up to 100% of the extract heating/cooling, achieved - "consecutively" in 2 stages:

1st stage - the sorption rotary heat exchanger, recovers more than 70% of the heatig/cooling and humidity.

2nd stage -the evaporator/condenser of the air to air heat pump, recovers the rest up to 100%.

Manufacturer	:	DamVent	
Homepage	:	http://damvent.com	
Product name	:	max.e3	
URL:	:	http://damvent.com/web/files/richeditor/catalogs/max.e3/max.e3-bg.pdf http://damvent.com/en/products/max-e3	
Fit for purpose	:	Centralized ventilation for cinemas, theaters, discos, restaurants, museums, casinos, banks, hotels, airports, office buildings, shopping malls, hospitals and production	
Air flow	:	1500m3/h Rotary exchanger 77 % RECOUPARATION	
Installation pace	:	Normal	
Preconditions	:		
Usability	:	Installation from HVAC specialist.	
Availability	:	Local production .	
Health /Safety	:	Highly effective air filters. Noise insulation is also taken care of.	
Costs Installed [€/m²]	:	Prices on demand	
Other	:	Local service.	



РОТАЦИОНЕН РЕГЕНЕРАТОР

За всички типоразмери от серията *max.e³* се използва сорбционен ротационен регенератор въздух-въздух, изработен от алуминиево фолио и 34 молекулярно покритие, което повишава неговата ефективност поглъщайки водните молекули (тип *HM1*). Сорбционните регенератори осигуряват отличен метод за предварително охлаждане и изсушаване на пресния въздух, преди навлизането му в изпарителя.

Температурна ефективност (*Sensible*) – $E \geq 70\%$. Ефективност по влага – $E \leq 80\%$.

[ПРОЧЕТИ ПОВЕЧЕ](#)

ТЕРМОПОМПЕН АГРЕГАТ

100% DX Съоръжение на директно изпарение

Без допълнителни водни, електрически или топлообменници на директно изпарение в *max.e³*, което го прави независимо съоръжение от други допълнителни източници на топлина/студ (котли, чилъри, VRF системи и др.)

[ПРОЧЕТИ ПОВЕЧЕ](#)



6 Final remarks

There are already some factories for EPS, XPS and ventilation, producing on the local market.

The new products are mostly imported, which makes their price very high for the common customer.

The market is developing quickly.

