Development of windows and façade profiles and its direction in future

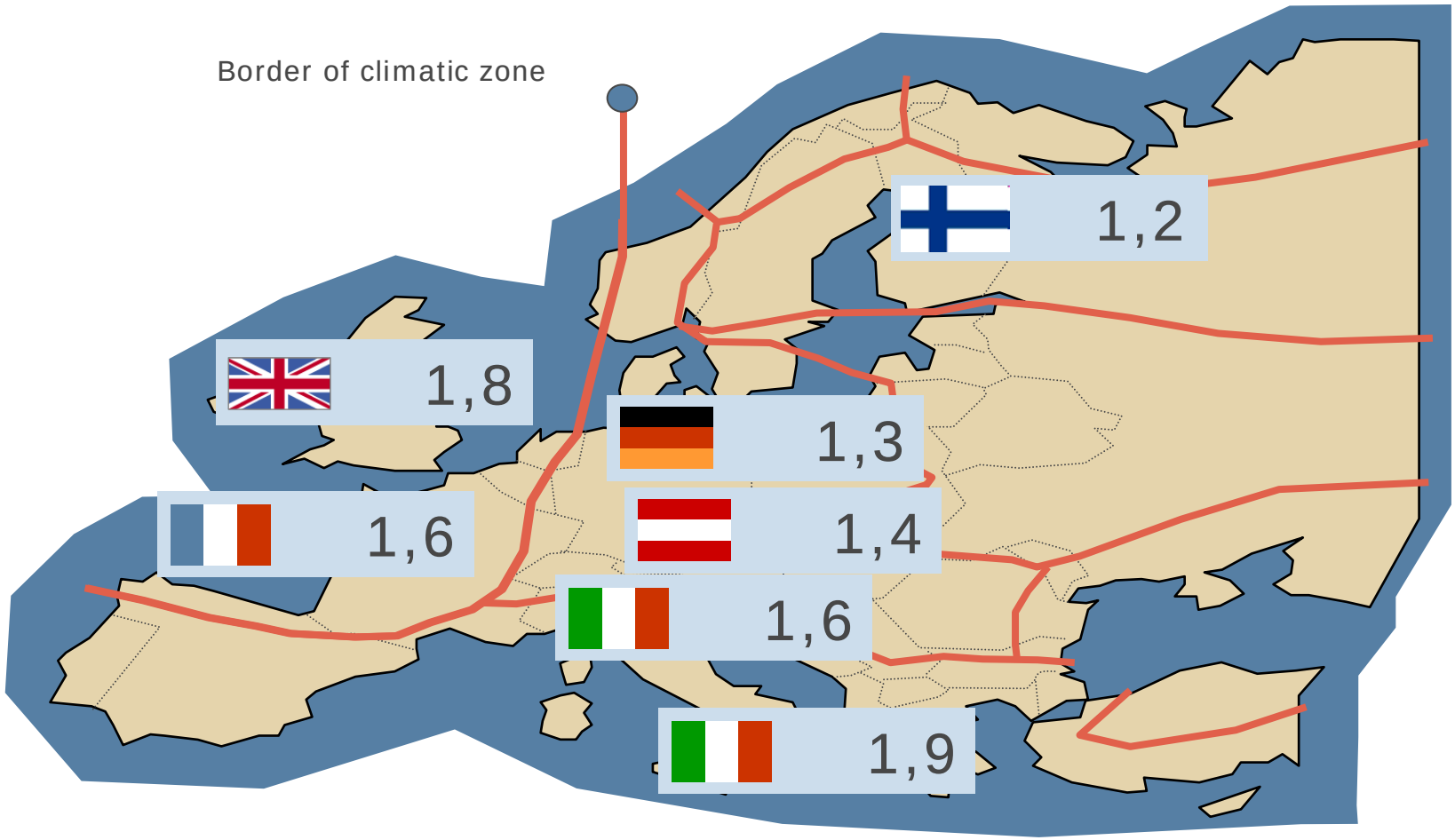
Design, calculation and verification in Europe

ift Rosenheim
David Hepp

ift certification centre
head of product certification

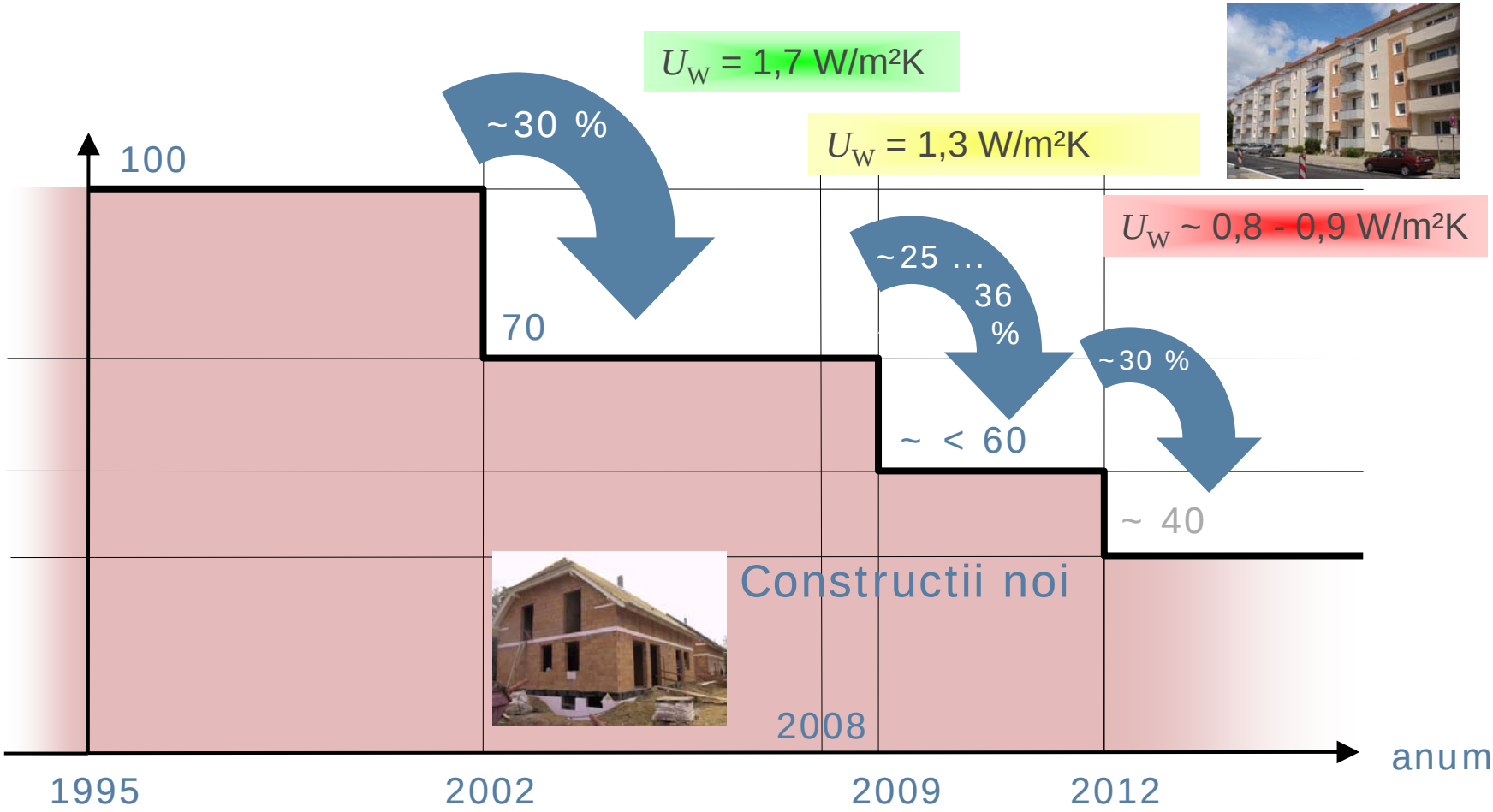
Consequences of the climate change

U-values: Requirements in Europe

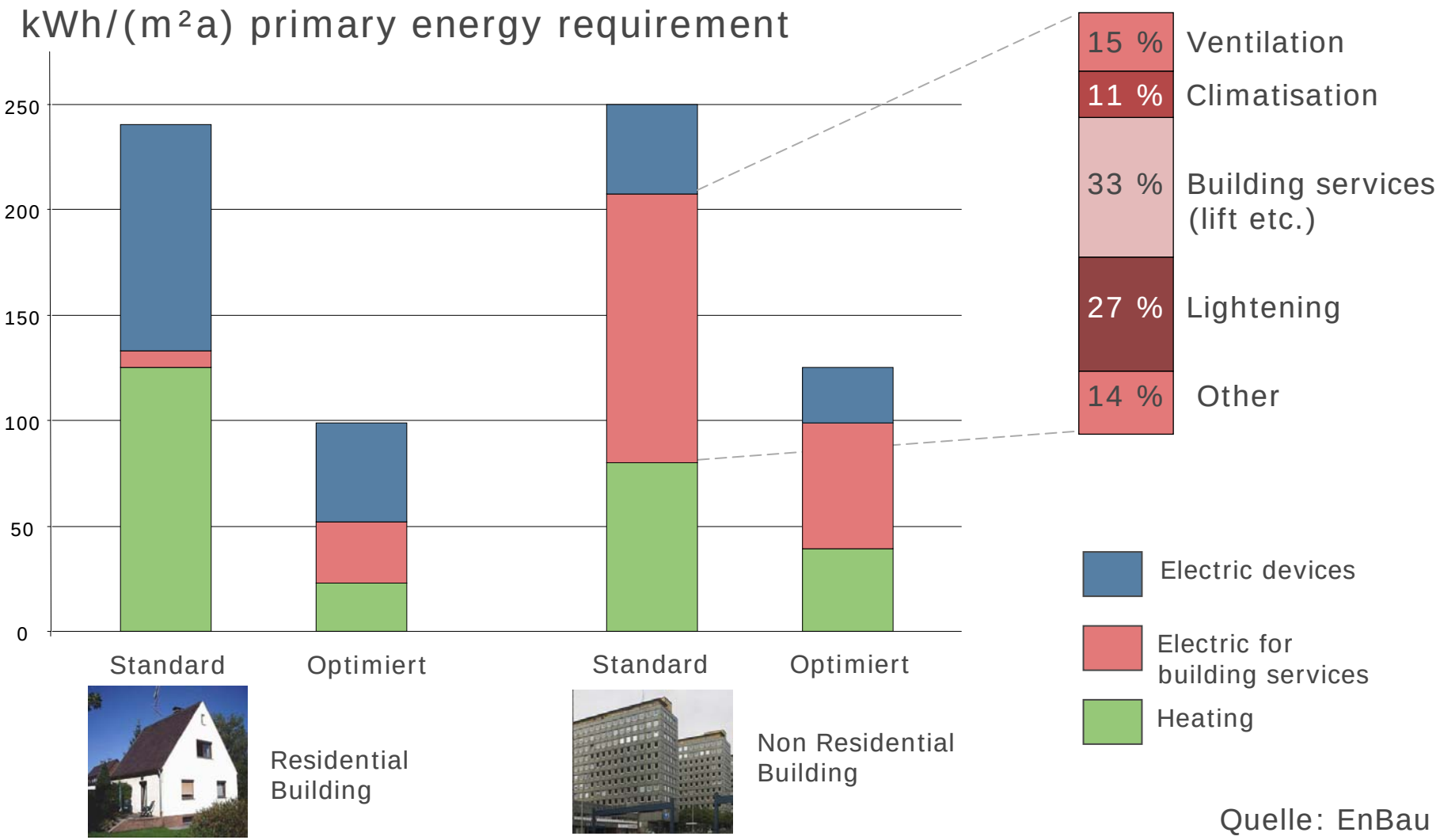


typical values for renovation

Development of the requirement level in German „Energy Conservation Regulation“ of housing (EnEV)

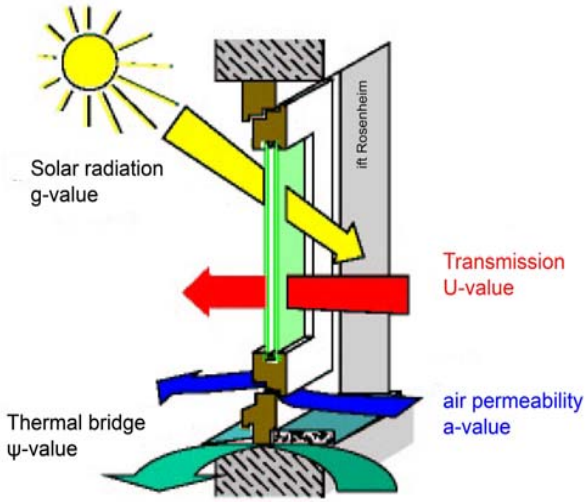


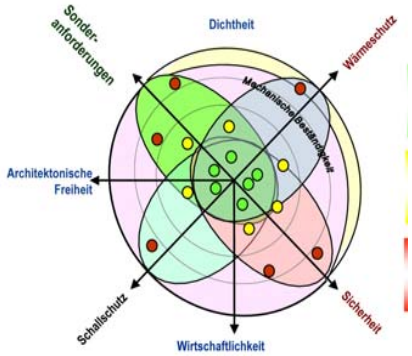
Optimizing of the energy consumption



Impact on windows and facades

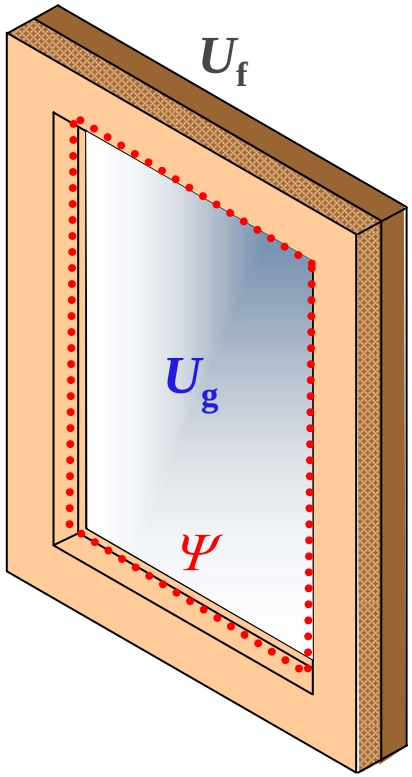
- Improvement of thermal insulation
- Disaster resistant constructions
- Intelligent use of solar protection
- Natural ventilation and climatisation
- Photovoltaics with glass
- Automatic windows and doors
- Sustainability of building products



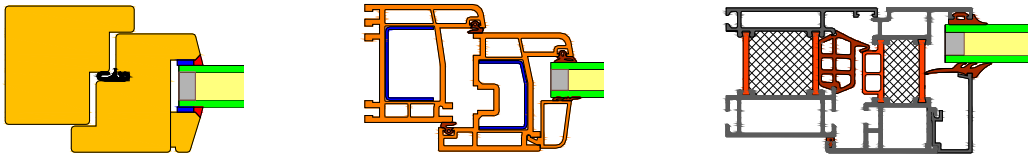


Criteria of windows

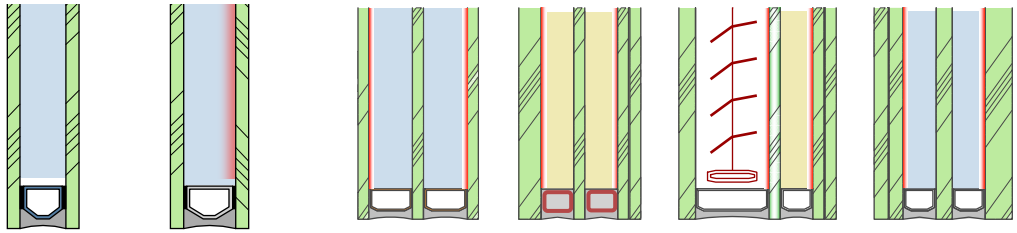
U_W
window



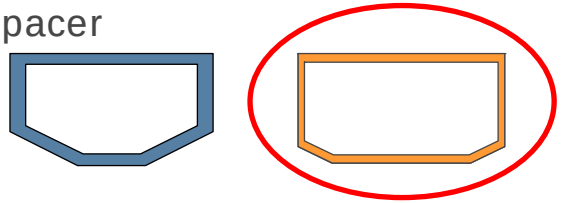
U_f
frame



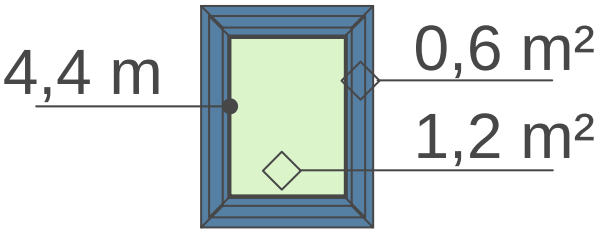
U_g
glazing

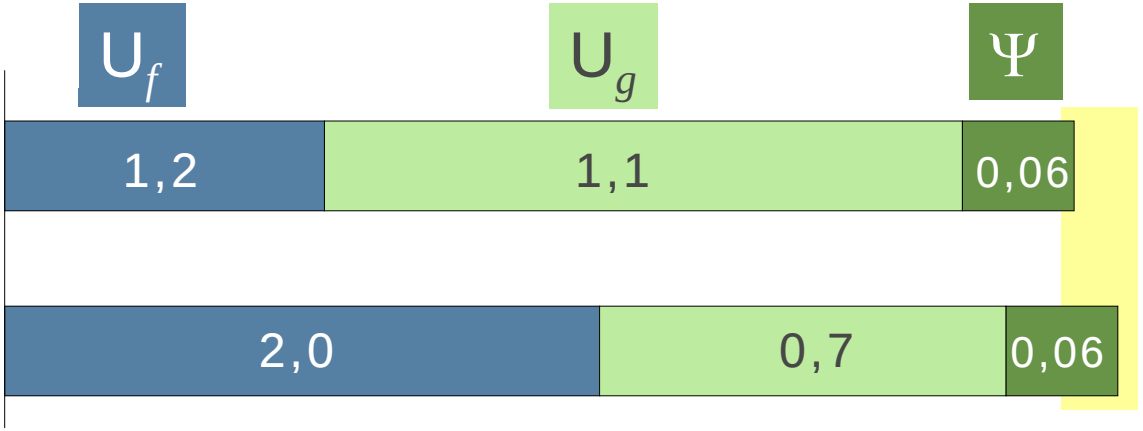


Ψ
spacer

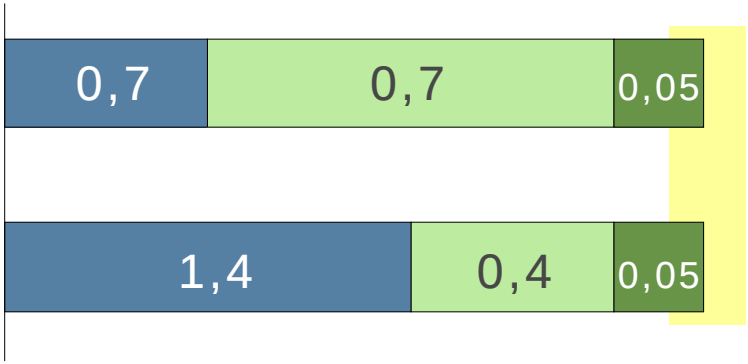


Windows: Case study





U_w = 1,3 W/(m²K)

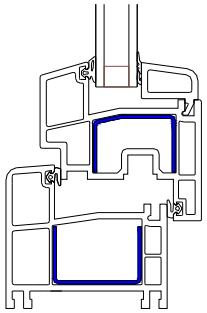


U_w = 0,8 W/(m²K)

Comparison of energy fluxes

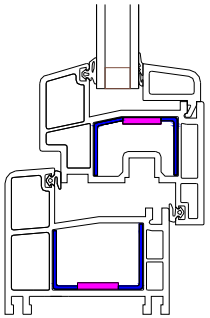
Optimizing potential of the thermal insulation of PVC-windows

U_f = 1,8 W/(m²K)



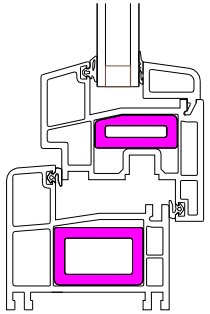
basis-profile

- 0,2



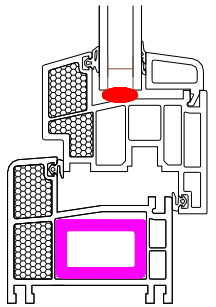
Reinforcement-profile with thermal break

- 0,3



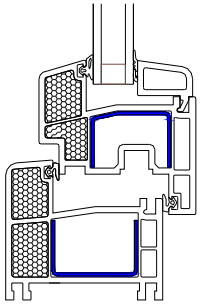
Reinforcement-profile made of plastics

U_f = 1,2 - 1,3 W/(m²K)



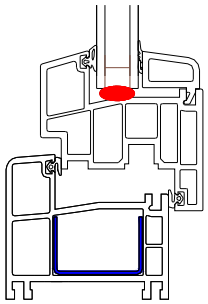
combinend measures

- 0,2



Front profile chamber with thermal insulation

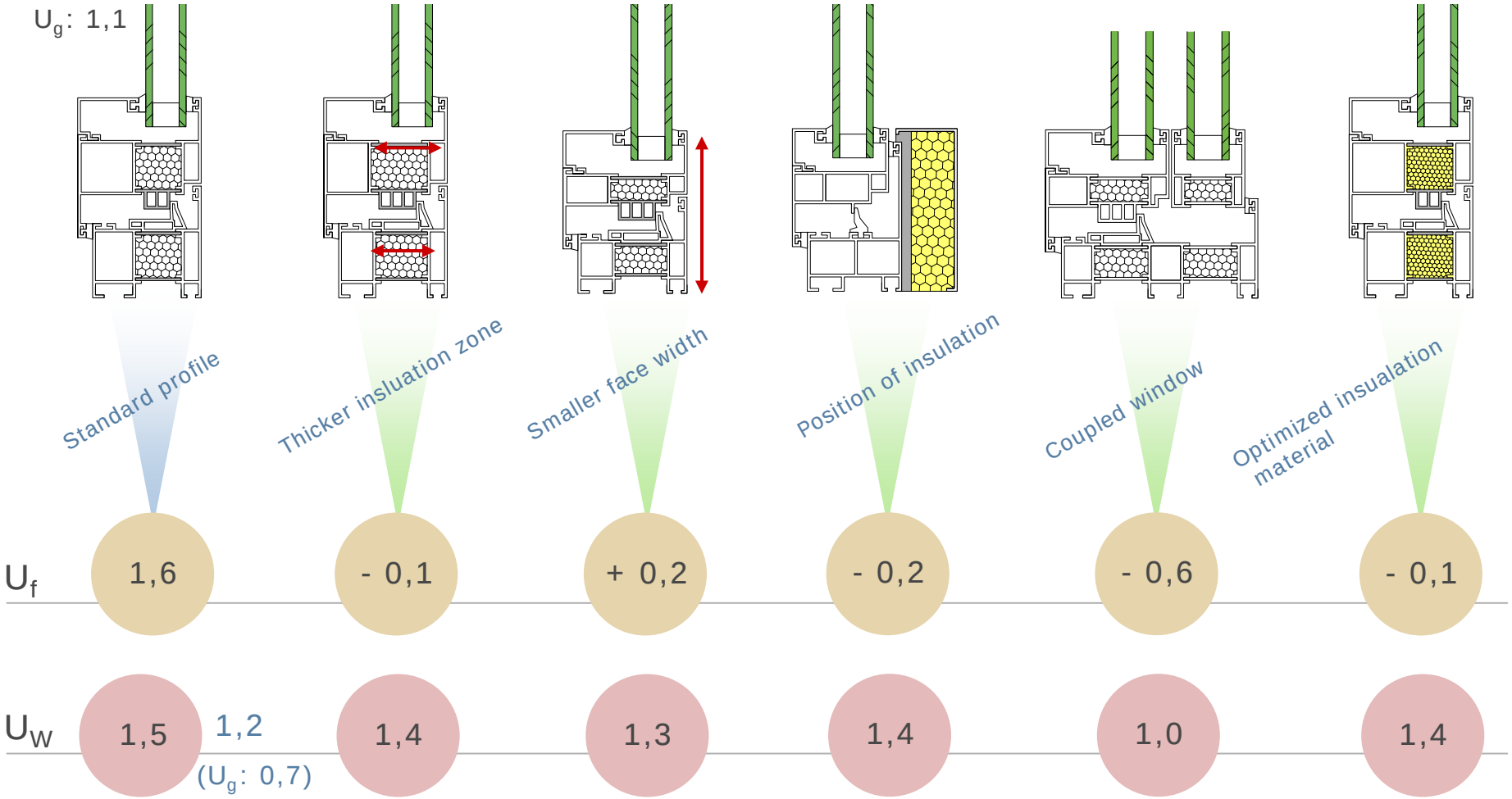
- 0,3



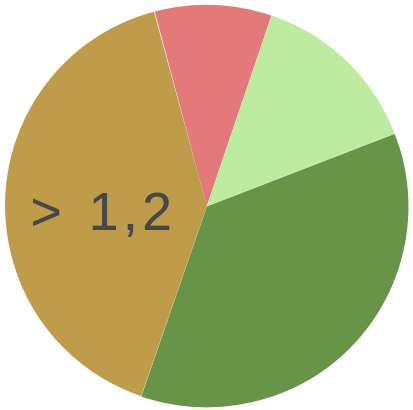
sealant glazing

Measures without further thickness of frame)

Optimizing potential of the thermal insulation of aluminium windows



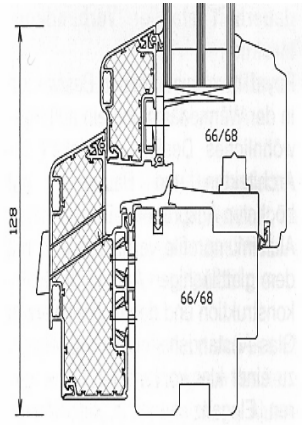
Standard UW-values timber



< 0,8

0,8 – 1,0

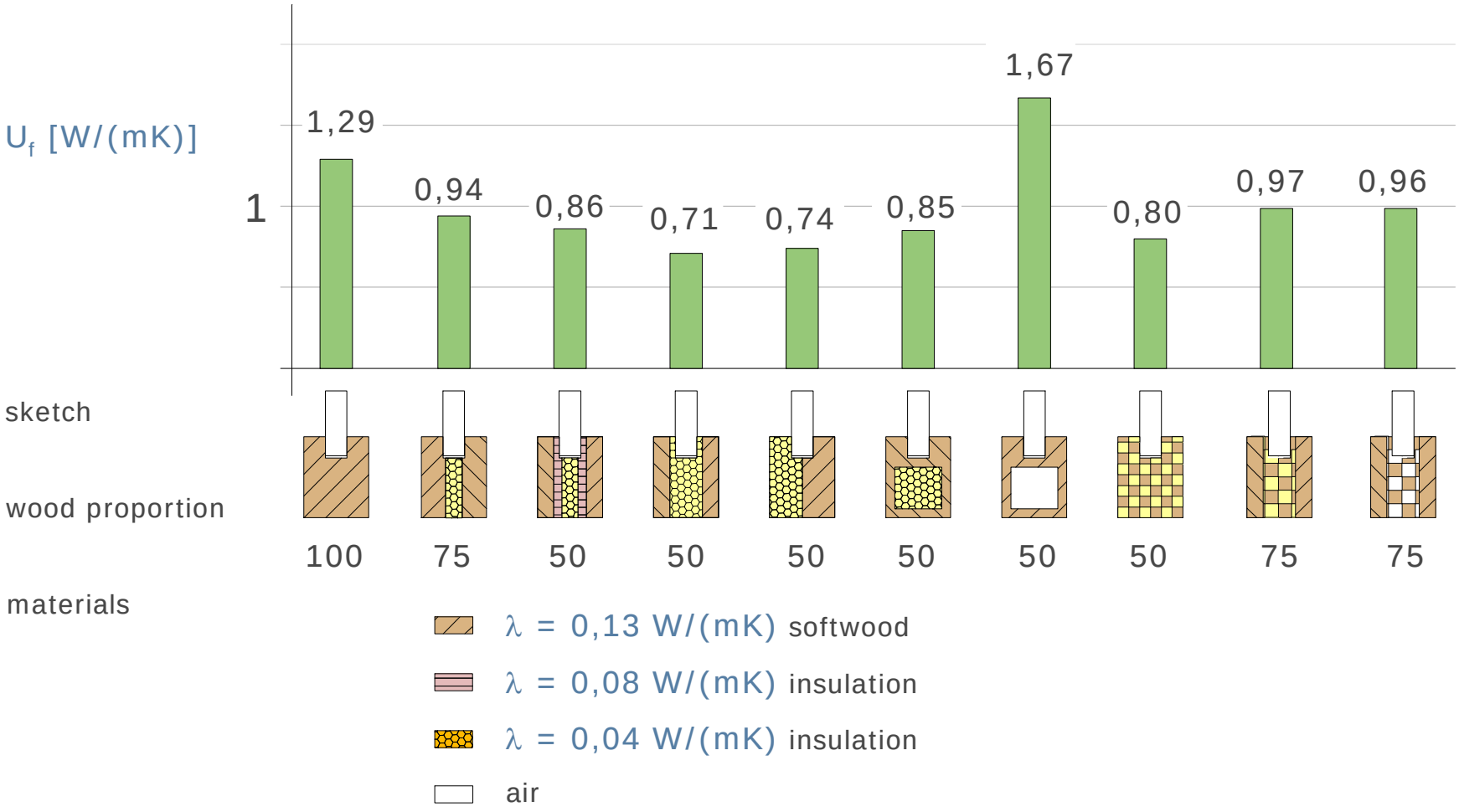
1,0 – 1,2



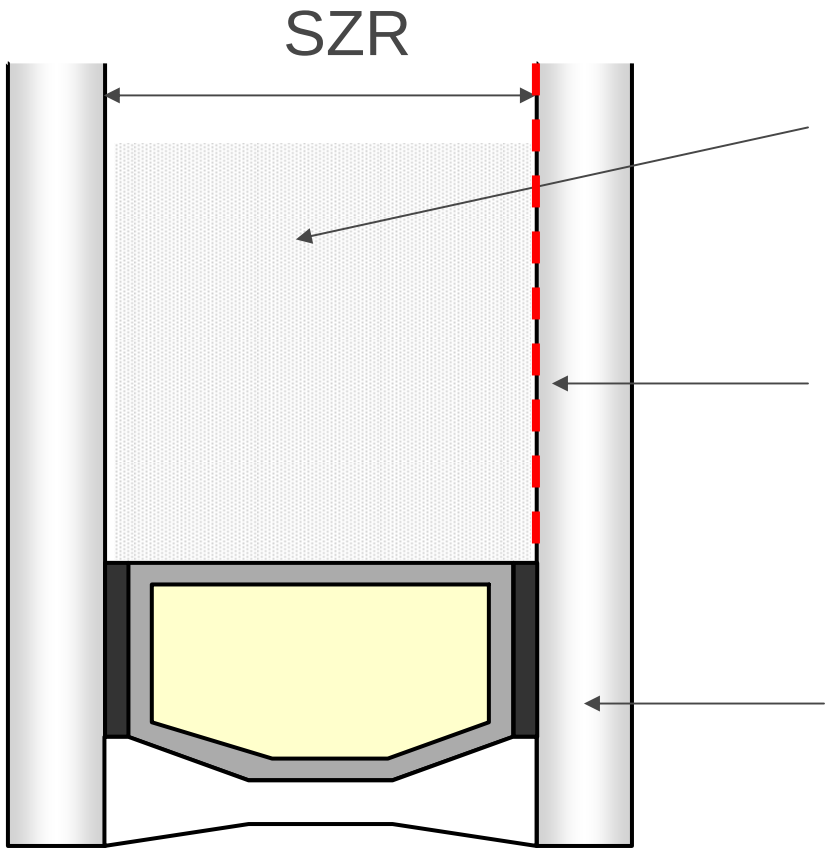
- Greater frame thickness
- Increasing amount of triple-glazing
- Insulation material inlays, filling profiles and sealing profiles
- Air chambers and insulation material layers
- Smaller profile width

Daten: Bauelemente Bau
Bilder: / Schüco, Gutmann, Reynaers, Holz Schiller, Niveau Fenster, KOWA

Uf: Positioning of the insulating materials



Which criteria have an influence to U-Value of glass?

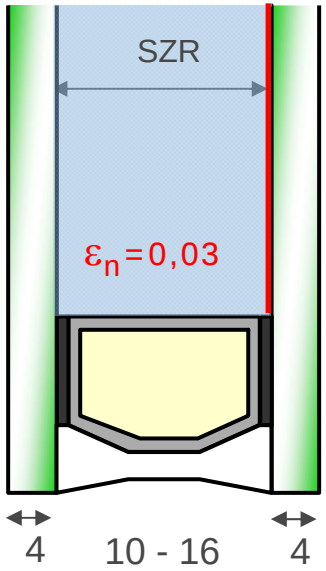


Gas filling (Air, Kr, Kr) and gas filling rate

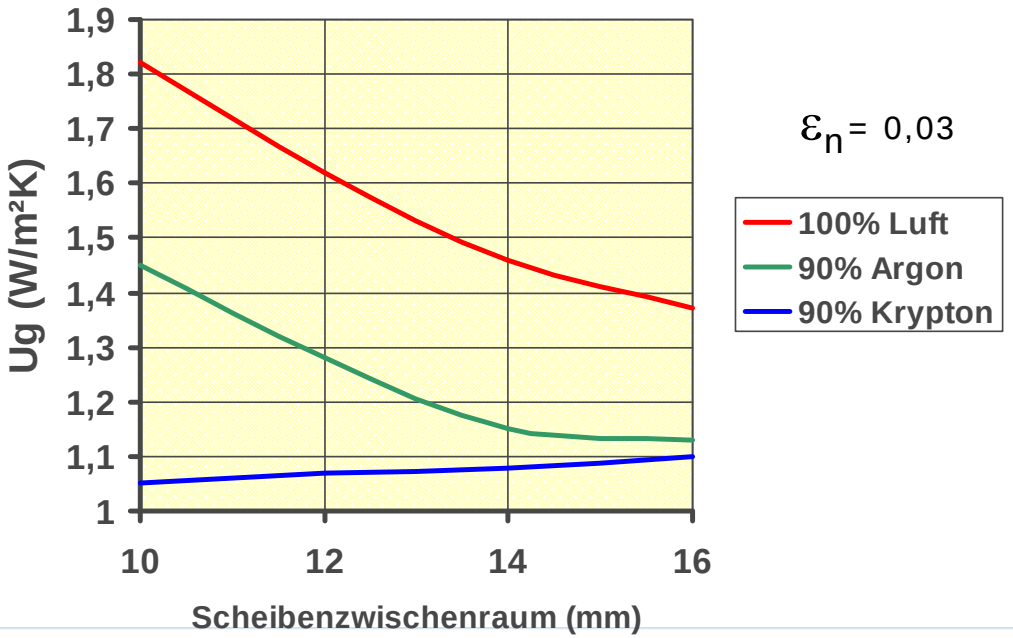
Coating thermal insulation and solar protection

Thickness of glass has only little influence

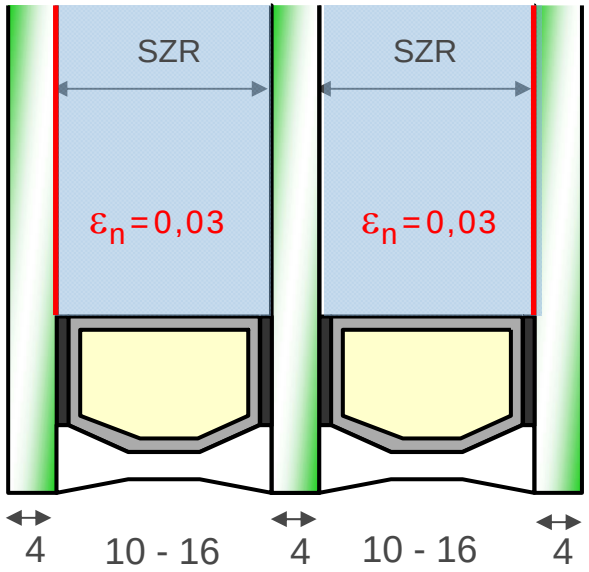
U-value glass of Double Low-E glass unit



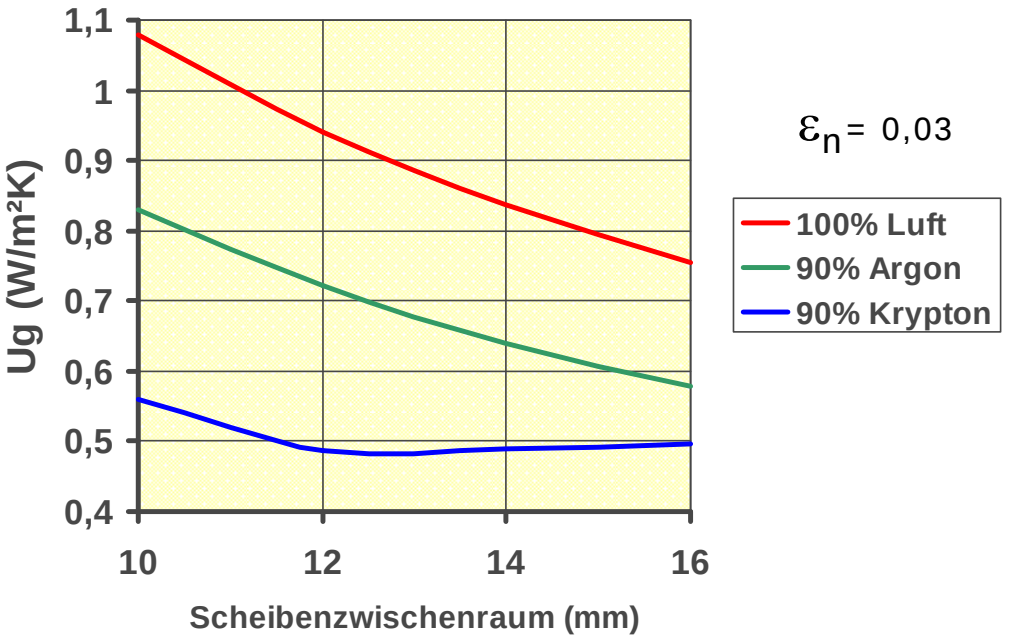
U_g (W/m²K) ε_n = 0,03	SZR 10 mm	SZR 12 mm	SZR 14 mm	SZR 16 mm
100% Air	1,8	1,6	1,5	1,4
90% Argon	1,5	1,3	1,2	1,1
90% Krypton	1,0	1,1	1,1	1,1



U-value glass of Triple Low-E glass unit

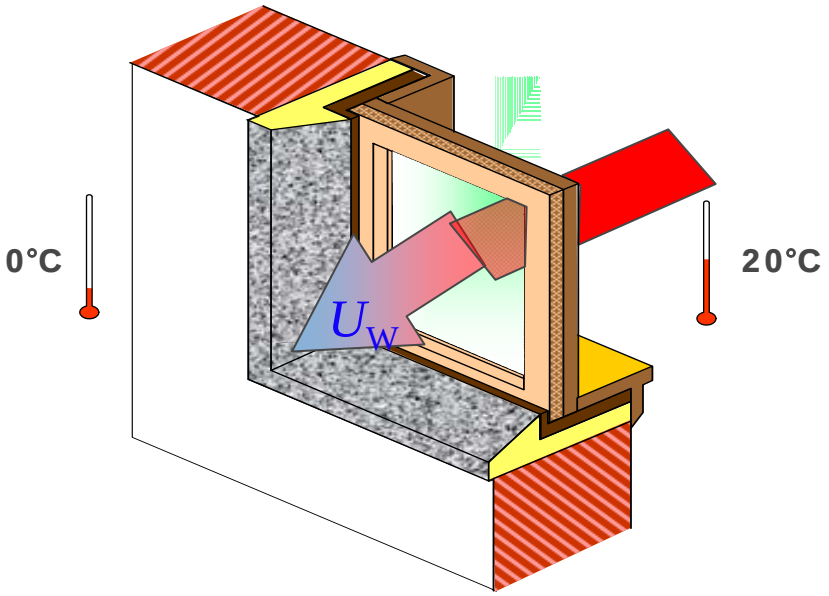


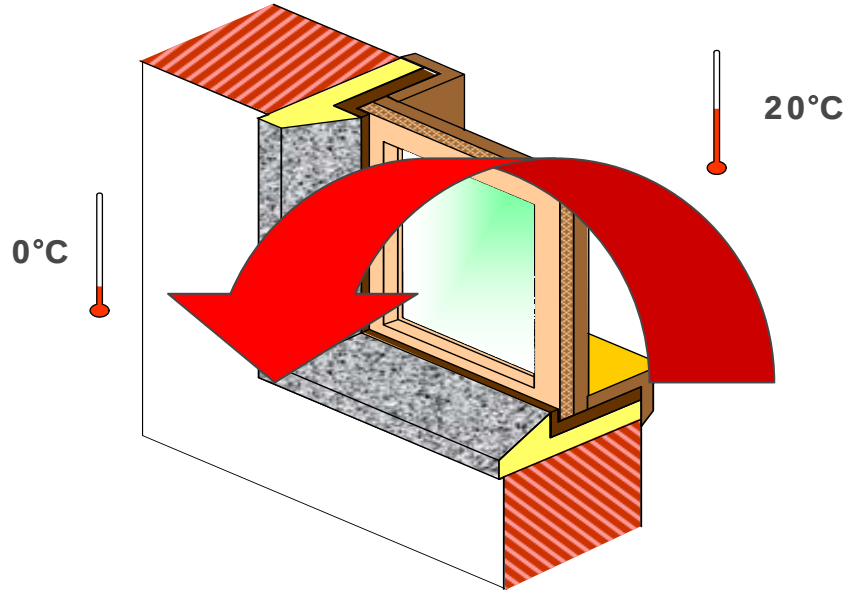
U_g (W/m²K) ε_n = 0,03	SZR 10 mm	SZR 12 mm	SZR 14 mm	SZR 16 mm
100% Air	1,1	0,9	0,8	0,8
90% Argon	0,8	0,7	0,6	0,6
90% Krypton	0,6	0,5	0,5	0,5



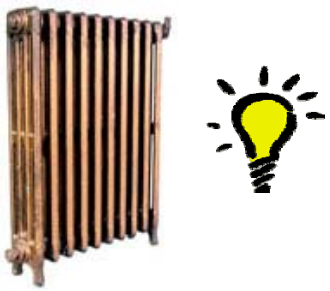
Negative climatisation methods with high energy consumption

Comparison of energy losses of transmission and ventilation



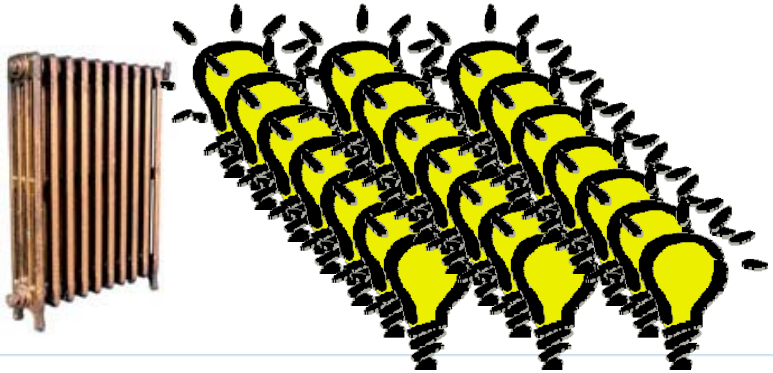


U_W = 1,7 W / m²K



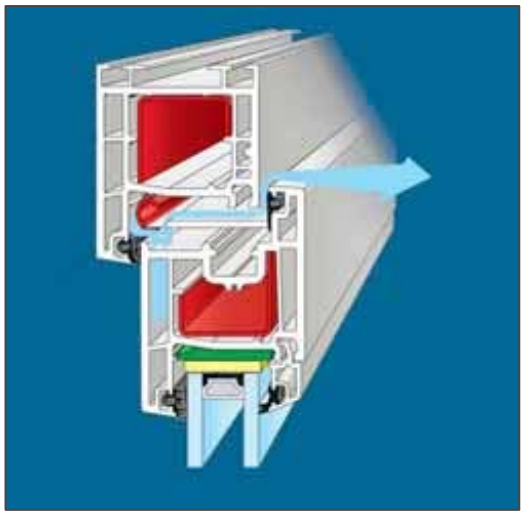
60 W

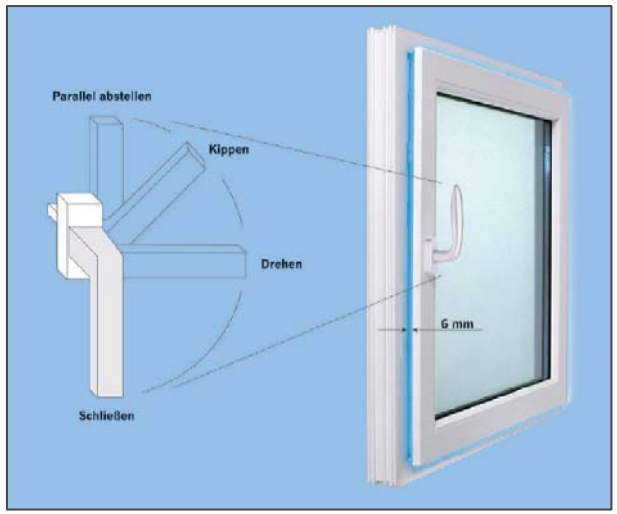
Air volume 170 m³/h

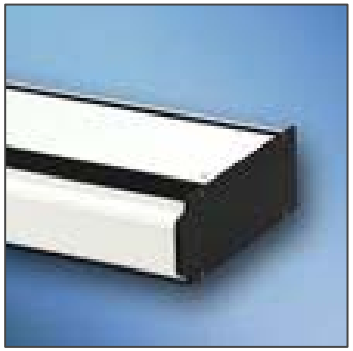


1240 W

Various ventilation systems







Window ventilation

Window ventilation: Teil 1

Determination of performance

R

ift-RICHTLINIE LU-01/1
Juni 2007

ROSENHEIM

Das Institut für
Fenster und Fassaden,
Türen und Tore,
Glas und Baustoffe

Fensterlüfter

Teil 1
Leistungseigenschaften

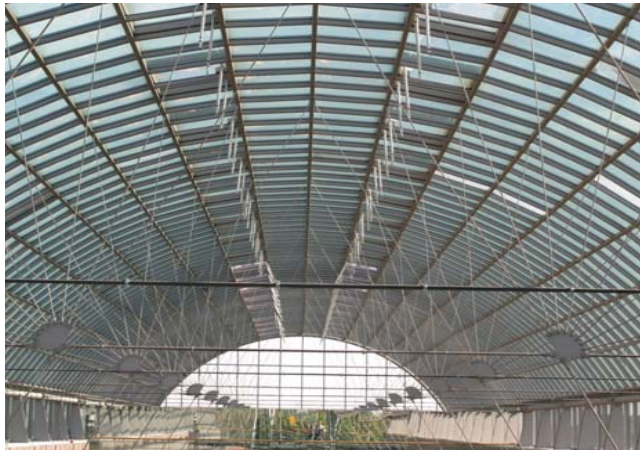
Ventilation systems for windows
Part 1
Performance characteristics

Inhalt

Solar Buildings and solar gaining

Solare architecture

Large transparent glass constructions

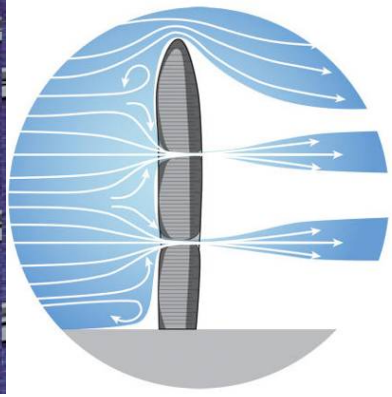


– Passive gain of solar power and aerodynamic lift

Solar thermal systems & photovoltaic for roofs, windows, and facades

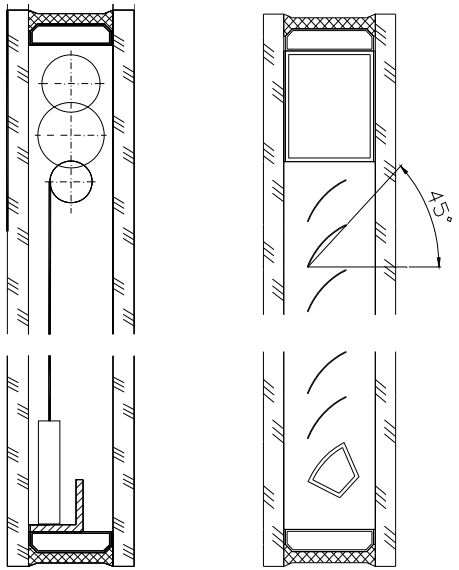
– Active production of heat and electric power and cooling

Use of wind energy

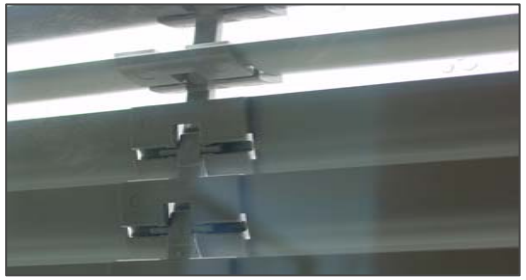


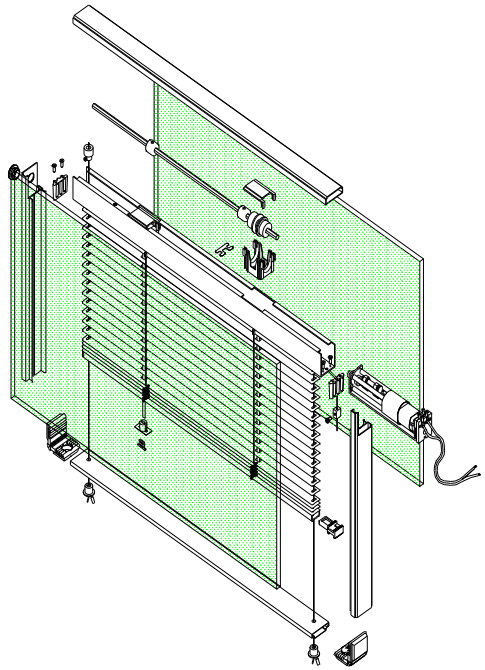
– Electric power caused by wind and aerodynamic lift
– climatisation

Solar protection inside the interspace



Vertical slat venetian blind, film blinds, plisse´, light control systems .....





Potential of solar energy

Grafik:
Trans-Mediterranean Renewable Energy Cooperation (TREC)

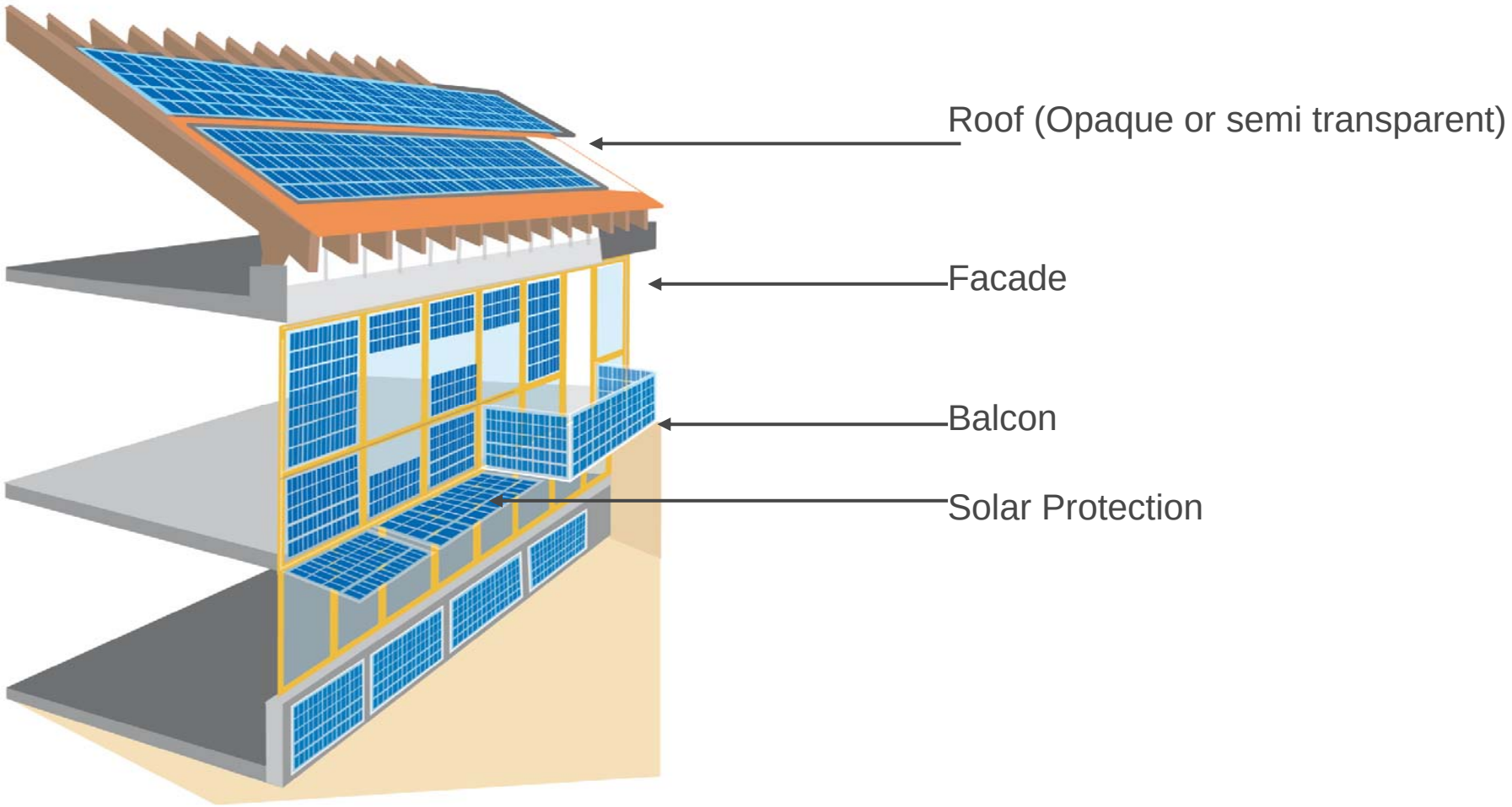
- Estimated space for solar collectors at the Sahara for the demand of electric power in

  - worldwide

  - EU

  - middle east
    (approximately the German demand)

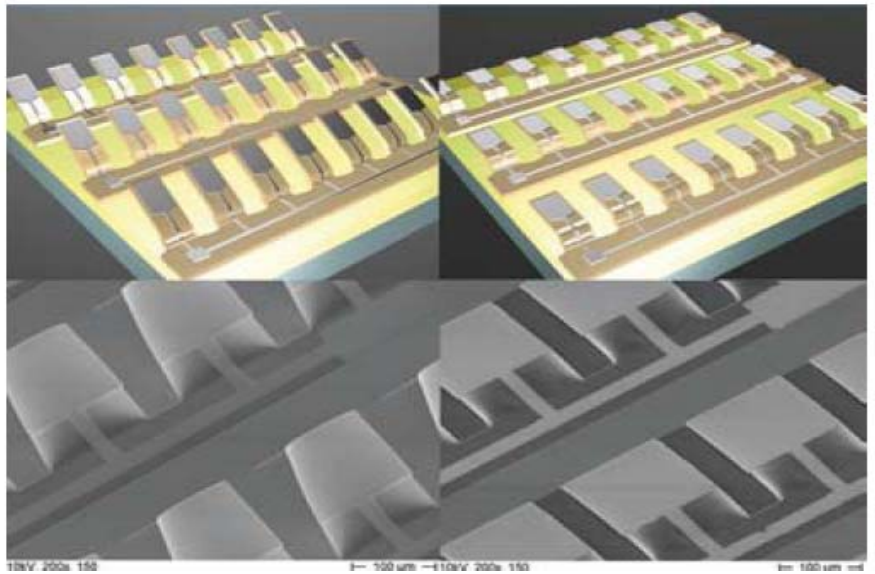
BIPV - Buidling Integration Photovoltaics



Adaptive Windows and Facades

Chromogene Glazing
(gasochrome, elektrochrome
and thermotrope glazing)

Mikros mirrors at the glass surface



Pictures:
Institut für Nanotechnologie and Analytik (INA), Kassel

Automatic windows and doors

Added value through „electronic elements“


Security

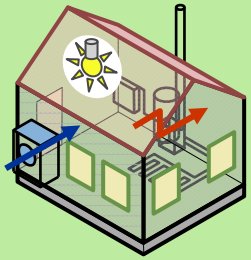

Comfort


Design for disabled and elderly people


Energy conservation/- gains

Where are the problems

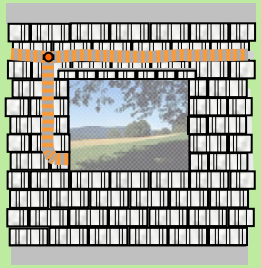
Building



Control

parameter

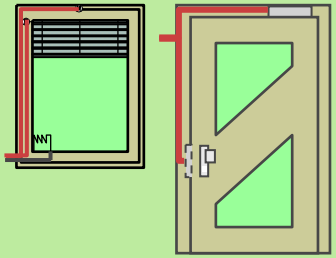
interface



Handover

Level of voltage

product



Wiring

Suitability of product

ift-guideline

Electronic in windows, doors and facades

ift-RICHTLINIE EL-01/1
Mai 2008

ROSENHEIM
Das Institut für
Fenster und Fassaden,
Türen und Tore,
Glas und Baustoffe

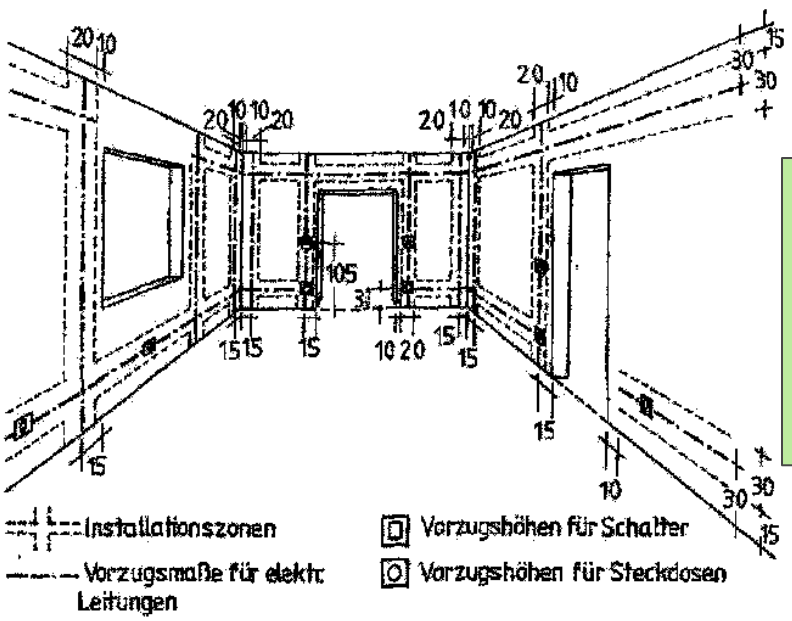
Elektronik in Fenstern, Türen und Fassaden

Teil 1
Leitfaden zur Planung

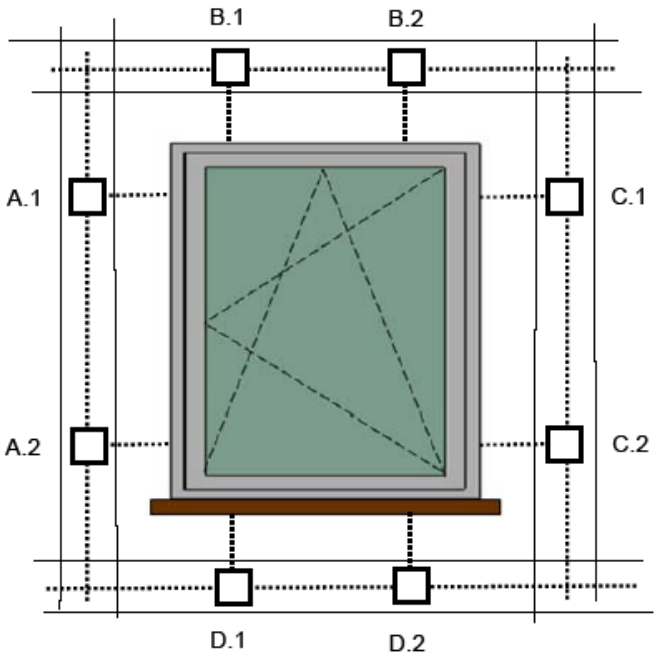
Electronic systems in windows, doors and facades
Part 1
Guideline for the project planning

Inhalt

Interface

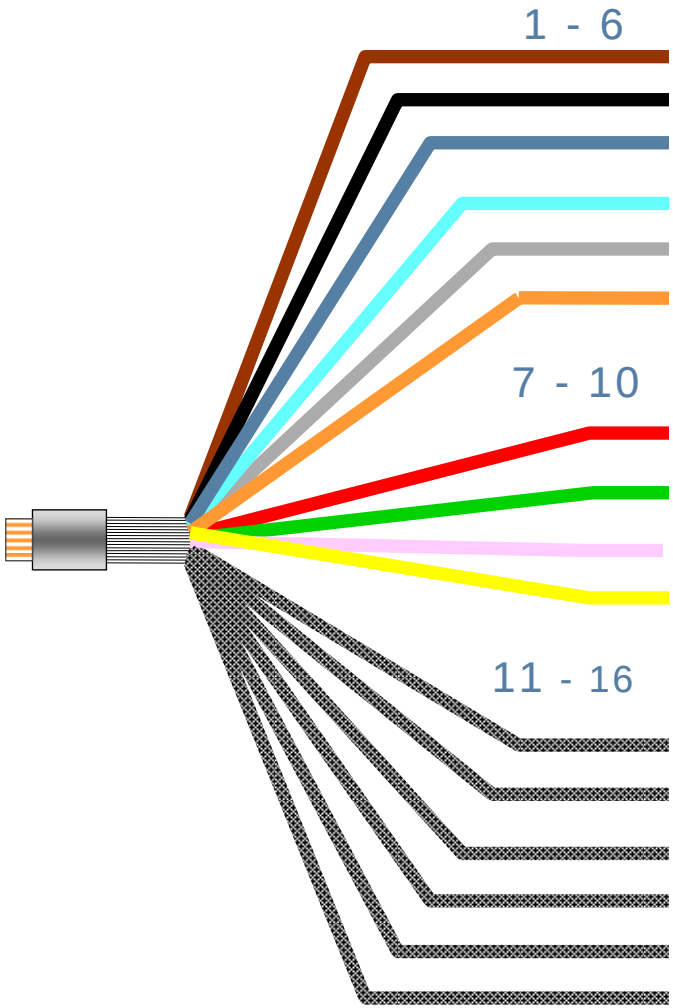


Layout of installation zones



Expansion of installation zones around the building component

Cables / plugs – proposal for clear colour-coding



1 - 6
drive window +
drive window -
Reserve
solar protection device +
solar protection device -
Reserve

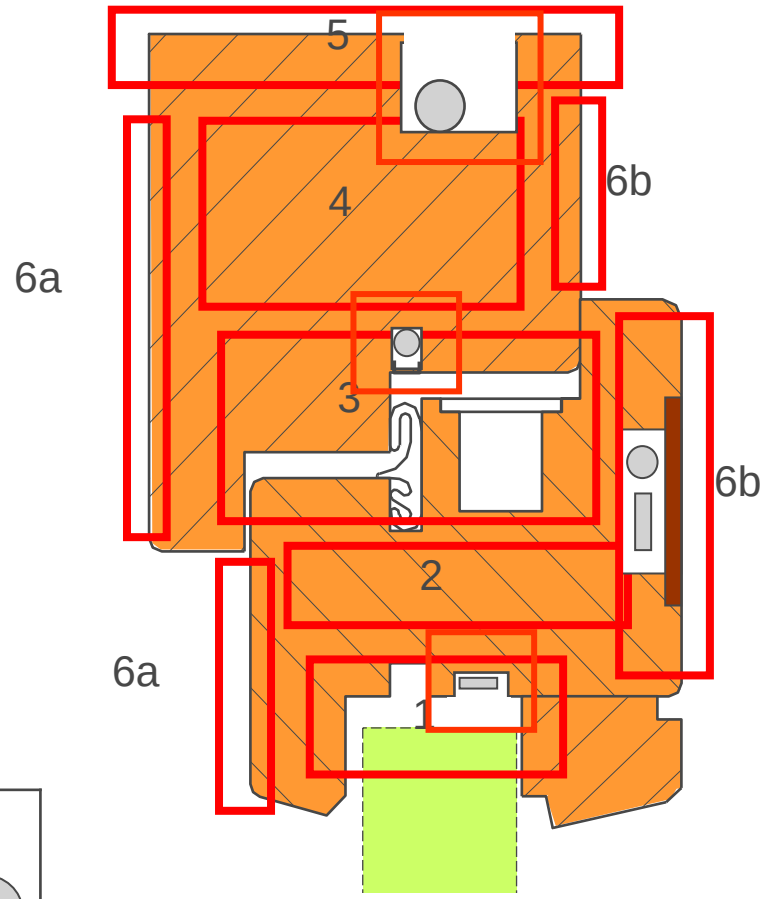
7 - 10
communication +
communication -
Reserve
Reserve

11 - 16
window contact +
window contact -
breakage detector +
glass beakage detector
Reserve
Reserve

Wiring

Analysis of potential areas

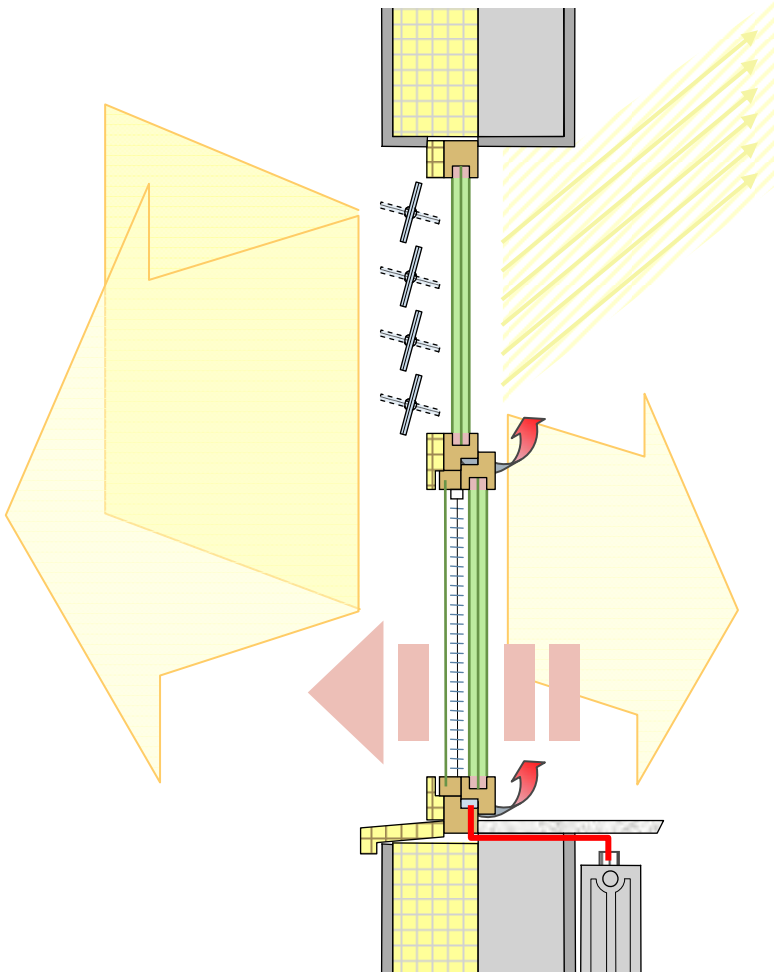
- accessibility
- physics
- space
- ...



Typical cross section of wires

sensors	drives	photovoltaics
∅ 3 mm	∅ 7 mm 5 x 1 mm	∅ 18 mm 12 X 6 mm

„Power manager“ in the wall: more than the U-value



- Light deflection
- Photovoltaics
- Solar shading
- Defined ventilation
- Solar gains
- Low transmission heat losses
- Linking to building services engineering

The sun is the engine of the earth, she spends light and warmth.

Windows are the drive of the building, they spend light and energy