

RETRO SOLAR



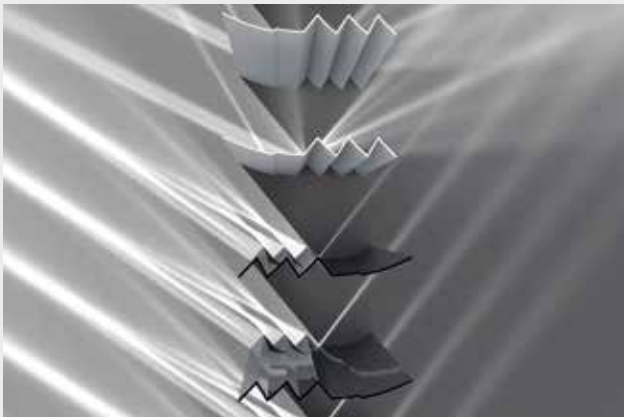
RETROLux Technology:
Transparency. Sun protection. Light redirection.



in cooperation with **DR. KÖSTER** LICHTPLANUNG

The New World of Mirror Optics

Innovations in Sun Shading Blinds
Enjoying Daylight and Saving Energy



RETROSolar is the sponsor of the latest generation in daylighting. With continuous support of the architect Dr. Helmut Köster **RETROSolar** has developed a whole series of louver mirror optics for blinds to be installed in glass facades and glass roofs for external and internal application.

The summary presents the basic ideas and functionalities of different types of mirror louvers which have already successfully been realised in many countries of the world.

RETROSolar is devoted in saving energy by less cooling but better daylighting for a much healthier indoor climate under the natural spectrum of daylight.



summer sun

Paradigm Shift in Blinds

The Future: Daylight Management with Mirror Optics



Uniqueness of Köster* technology based on mirror optics:

- lowest SHGC values, dimming of intense solar radiation
- precision in light guidance
- protection and supply function provided
- maximum user comfort due to simultaneous view through
- natural daylight spectra are maintained
- beneficial to health

*Dr. Köster ist developer and patent holder of the mirror louver contours

winter sun

Bifocal Louver Optics

with integrated functions controled by the angle of incidence of the sun

horizontal louver position

light in

heat in

view through

glare free

Unprecedented possibilities in the simultaneity of the most important sun protection functions:

- best transparency due to slimmest louver cross-sections
- deflection of the overheating summer sun
- glarefree supply of natural daylight
- energy input controlled via the angle of sunlight incidence
- self control of the functions
- "heating" and „cooling“ by means of light deflection
- healthy daylight

- optical daylight modulation
- optical energy transport
- optical heat control

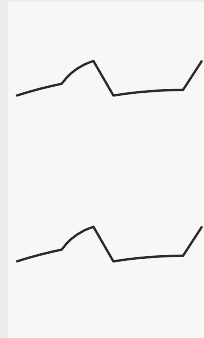
RETROLux A, External



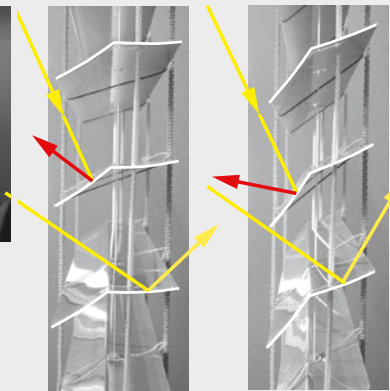
RETROLux A
external blinds 80 mm



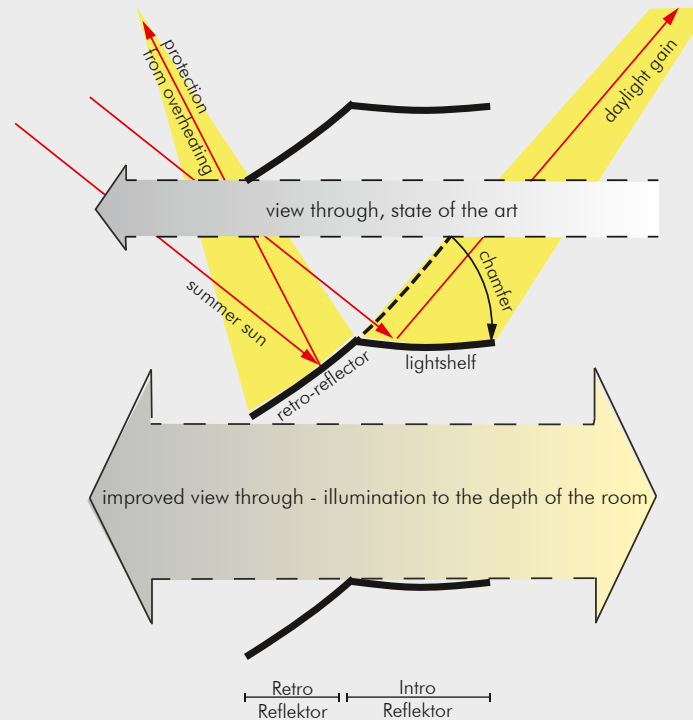
RETROLux A
external blinds 80 mm



Bifocal sun protection louvers for external venetian blinds with light deflection- and reflection function, solar protection, improved room illumination and optimized view through

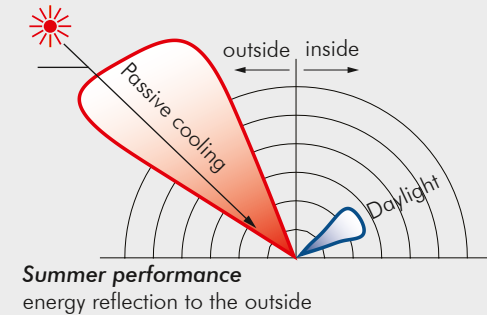
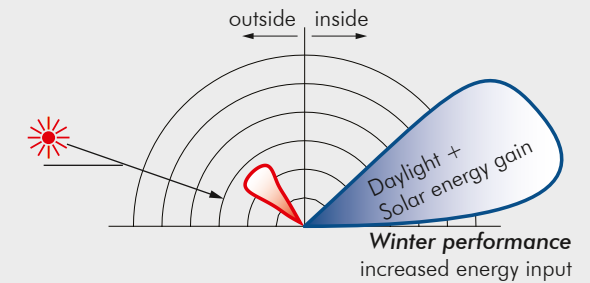


RETROLux A 80 mm, external intelligent sun shading with a clear view through



BRDF
Bidirectional Reflection
Distribution Function

BTDF
Bidirectional Transmission
Distribution Function



Simultaneity of unique functions:

- passive cooling
- daylight control
- illumination to the depth of the room
- solar gain
- visual transmission/ view through

The bifocal technique:

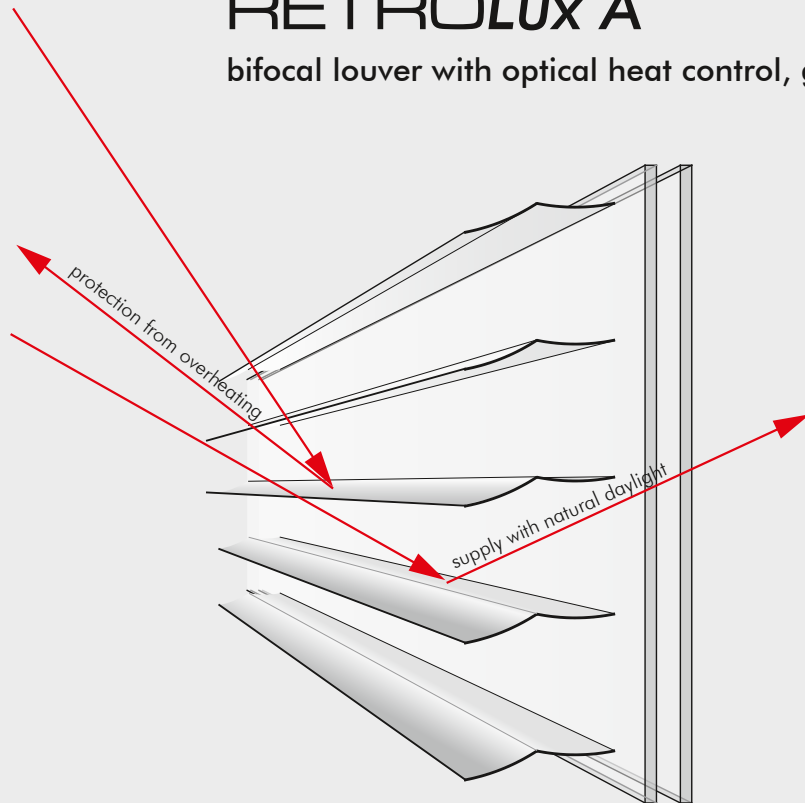
- two functions due to central bending of the slats:
- retro-reflector: protection function
- light redirection: supply function
- self-control of the functions by the sun's angle of incidence

Intelligence of the louvers:

- flat sun in winter: solar gain
- high summer sun: sun reflection back into the sky also protects the streets from overheating
- diffuse light input into greater room depths

RETROLux A

bifocal louver with optical heat control, glarefree daylight modulation, light deflection to the depth of the room

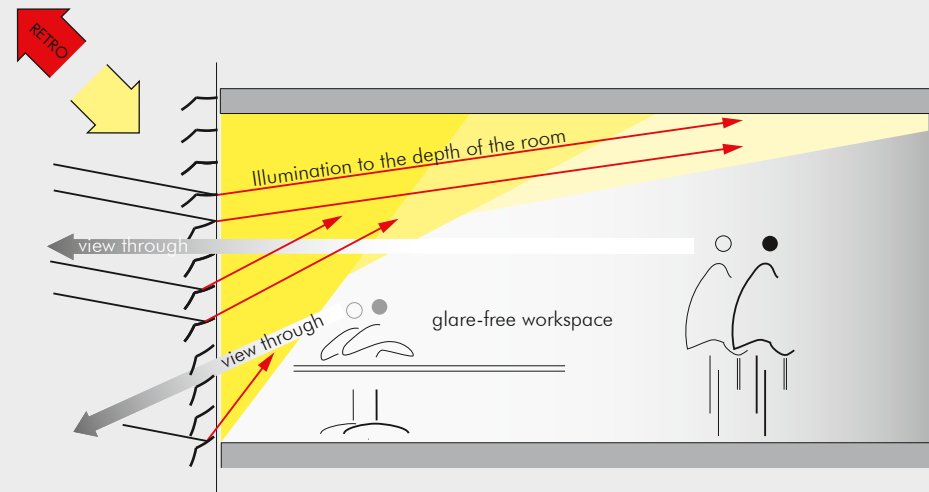


3 essentials simultaneously:

- daylight redirection, glarefree
- view to the outside
- protection from overheating

Urban planning advantage:

- excess energy is reflected back into the sky
- overheating of the microclimate in inner-city streets and squares is avoided



RETROLux, Internal



RETROLux 75
for interior blinds and double skin facades



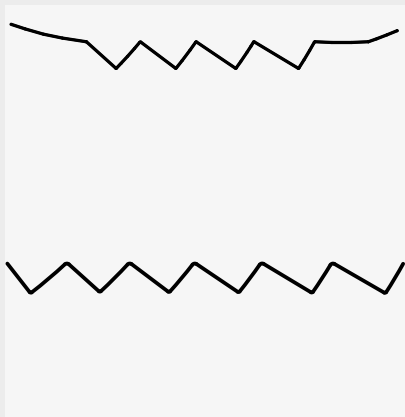
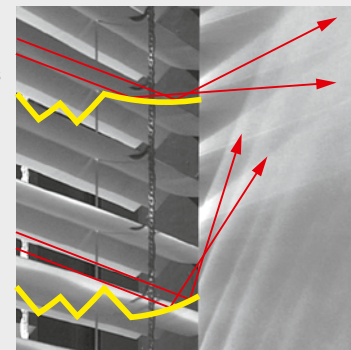
RETROLux 50
for interior blinds and double skin facades



RETROLux 25
for interior blinds and compound windows



RETROLux 20
for interior blinds and compound windows



RETROLux, Internal
75 mm louver width
retro technology for gaining zenith light

gain of zenith light

Protection from overheating

View through 88 %

850 - 1500 lx
target daylight coefficient

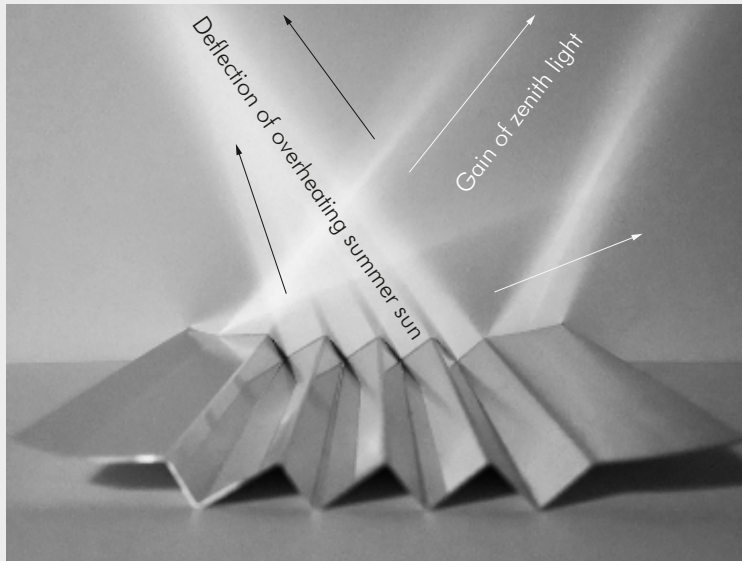
> 1.70 m type O
< 1.70 m type U

- Horizontal louver position for solar incidence $> 30^\circ$
- 88% view through between the louvers
- Curtain remains active even when the sky is cloudy

- Upper window area: Gain of zenith light in room depth
- lower window area: Protection from overheating
- Excess energy is reflected back into the sky, therefore,
- overheating of the interior as well as overheating of the streets is avoided
- excellent visual comfort

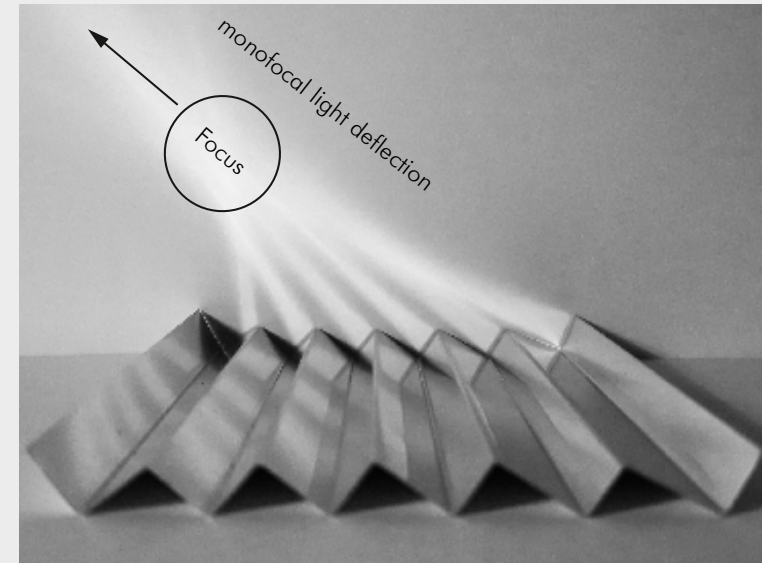
RETROLux Mirror Louvers

Retro technology for gaining zenith light
precision in light and energy management



Zenith light for deep room illumination

RETROLux type O is installed in the upper part of the window and offers zenith light gain and deflection of flat sunlight. Excess solar radiation is deflected. Despite excellent solar shading, the interiors are well lit with natural daylight.

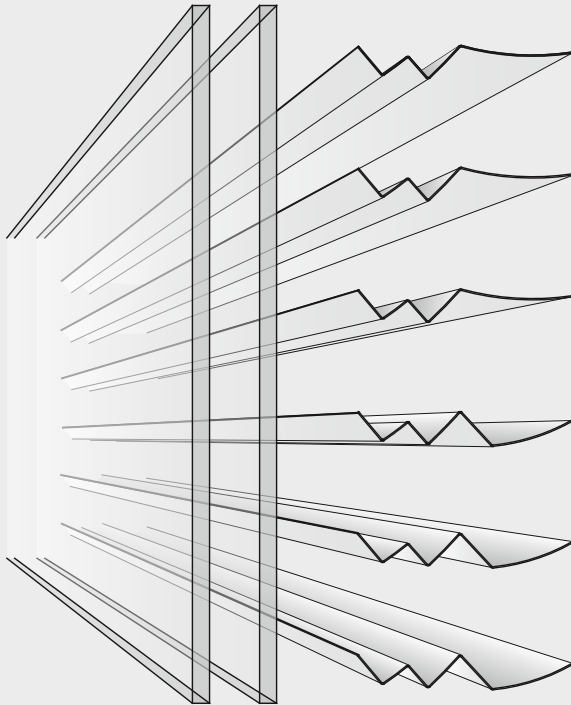


Protection from overheating

RETROLux type U is installed in the lower window area and has an outward focus. Incident sunlight is reflected back into the sky without placing a thermal load on the interior. The horizontal slat position ensures transparency and diffuse light incidence.

RETROLux

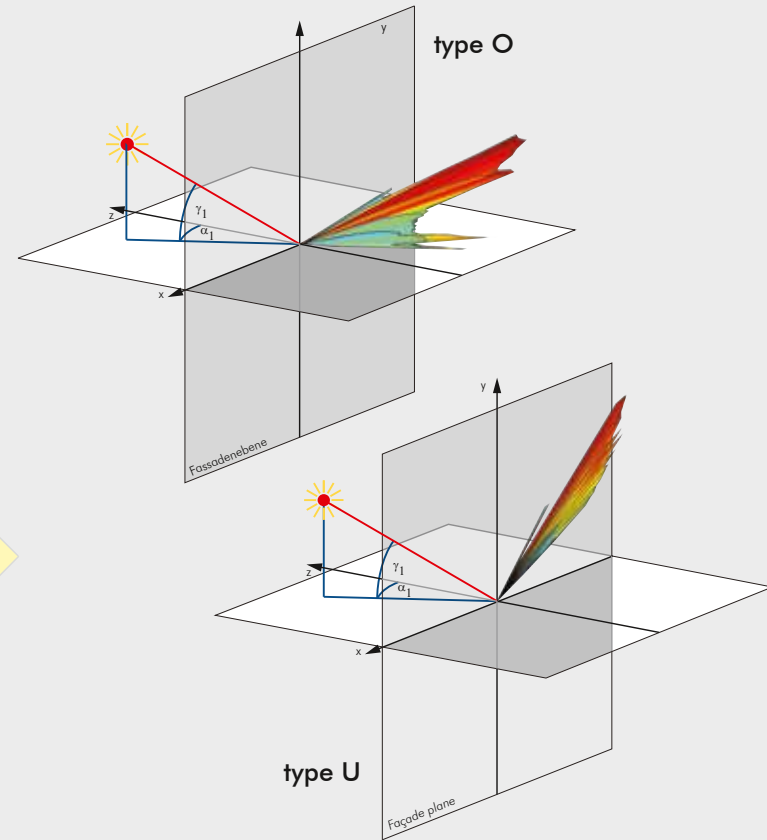
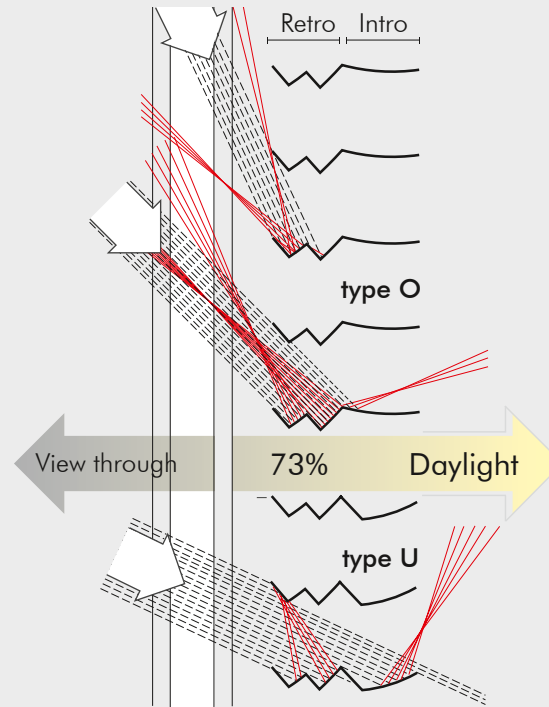
50mm louver width



Bifocal:

Focus outside: Solar protection function

Focus inside: Light deflection



Advantages of the bifocal technology:

Simultaneity of unique functions:

- passive cooling
- daylight irradiation
- deep room illumination
- solar gain
- view through while solar protection

Functions of the bifocal technology:

- two functions in one louver:
- retro-reflector w-shaped
- light deflection reflector
- control of the different functions by the angle of solar incidence

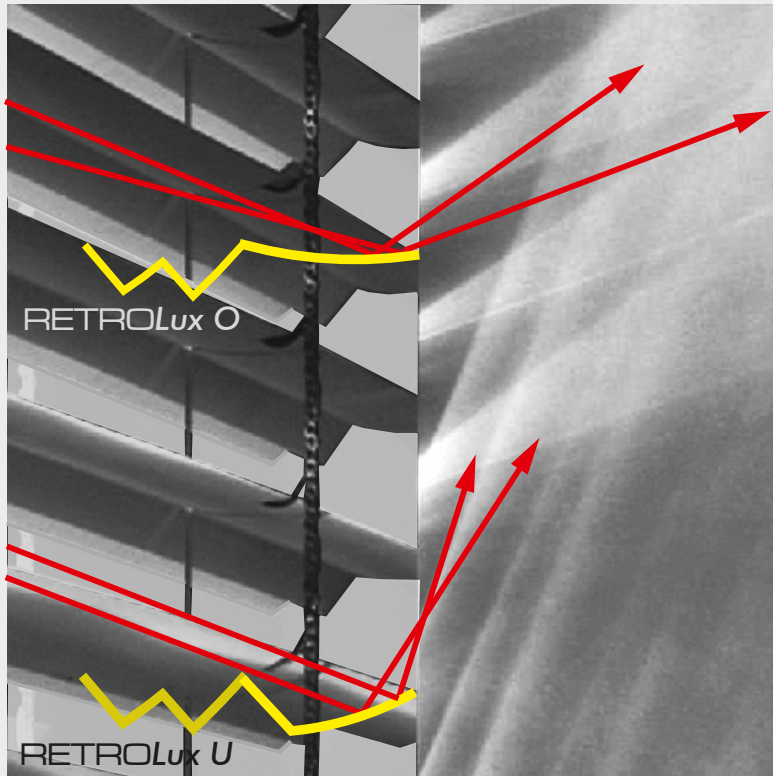
Intelligence of the louvers:

glare-free light distribution towards inside by different louver types within the same curtain.

- type O: room depth lighting
- type U: indirect daylight irradiance

RETROLux

highest precision in glare-free light guidance

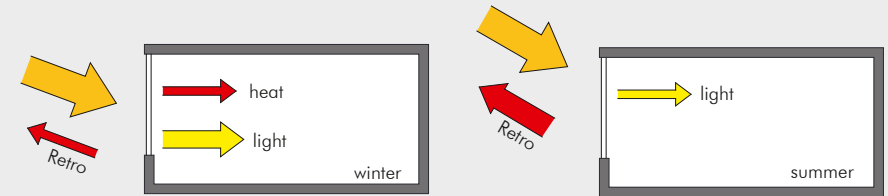


glare-free light guidance:

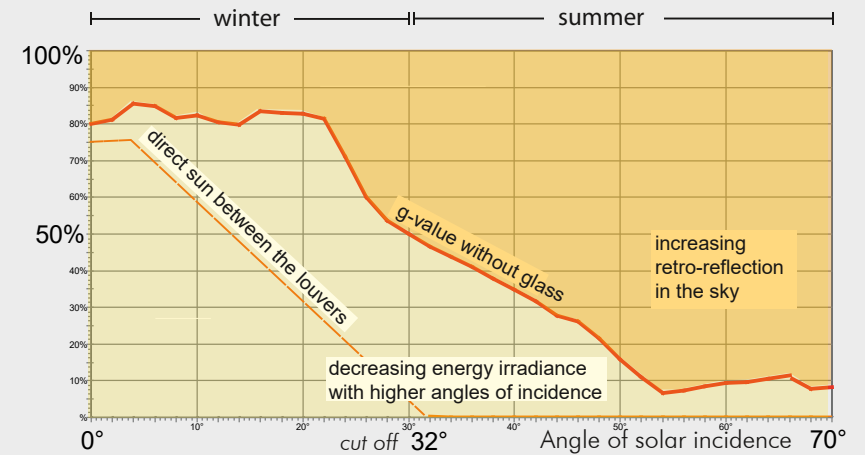
- in the upper window area light irradiance into the room depth
- in the lower window steeply to the ceiling

USP:

- open position of louvers, excellent view through during summer sun also
- passive cooling
- control of the functions by the angle of solar incidence
- gain of diffuse sky radiation



optical energy management by specific mirror contours of the louvers



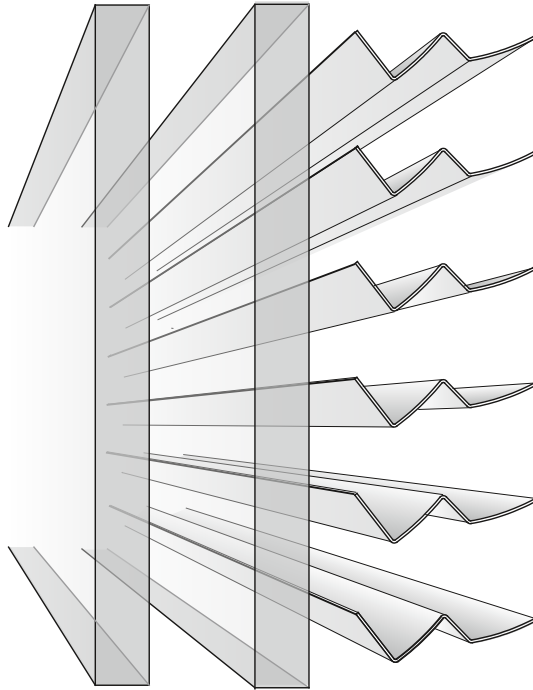
intelligence of the louvers:

Energy management by the angle of incidence:

- low sun in winter: light and heat gain
- high sun in summer: light beam only, heat out
- excess energy is reflected back into the sky, therefore,
- protection from overheating of the interior and the inner city climate

RETROLux

20mm louver width, internal



RETROLux 20 mm

to be applied interior or in a facade cavity

Bifocal mirror optics:

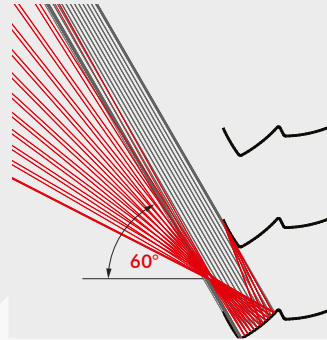
- v-shaped retro-reflector
- glarefree lightshelf

Technology:

- g-value 0.05 behind glass 66/28
- as glazing bead installation
- excellent view through > 70%
- excellent room illumination

Louver contours only schematic. Subject to change without notice

Unique Performance: Solar Protection, Room Illumination and View Through Simultaneously



BIFOCAL OPTICS

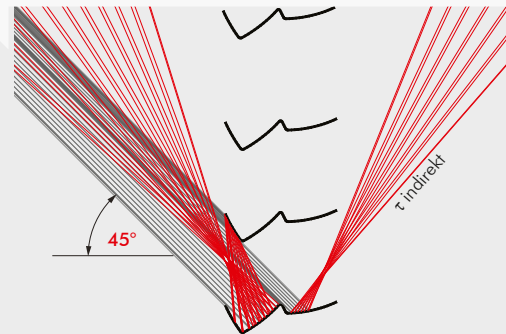
the raytracings show the
protection and supply functions

Protection function

first louver part, **focus to outside**
light reflection of the high summer sun

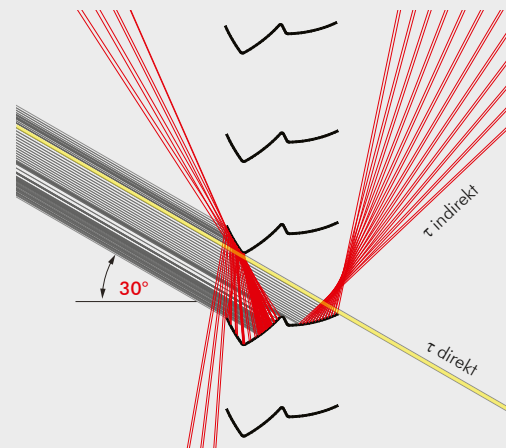
view through

light irradiance



Supply function

second louver part, **focus to inside**
light irradiance
diffuse light illumination



Direct transmission
of the flat sun,
louvers tracking possible

sun and glare protection guaranteed

RETROLux 20mm

The Perfected Window

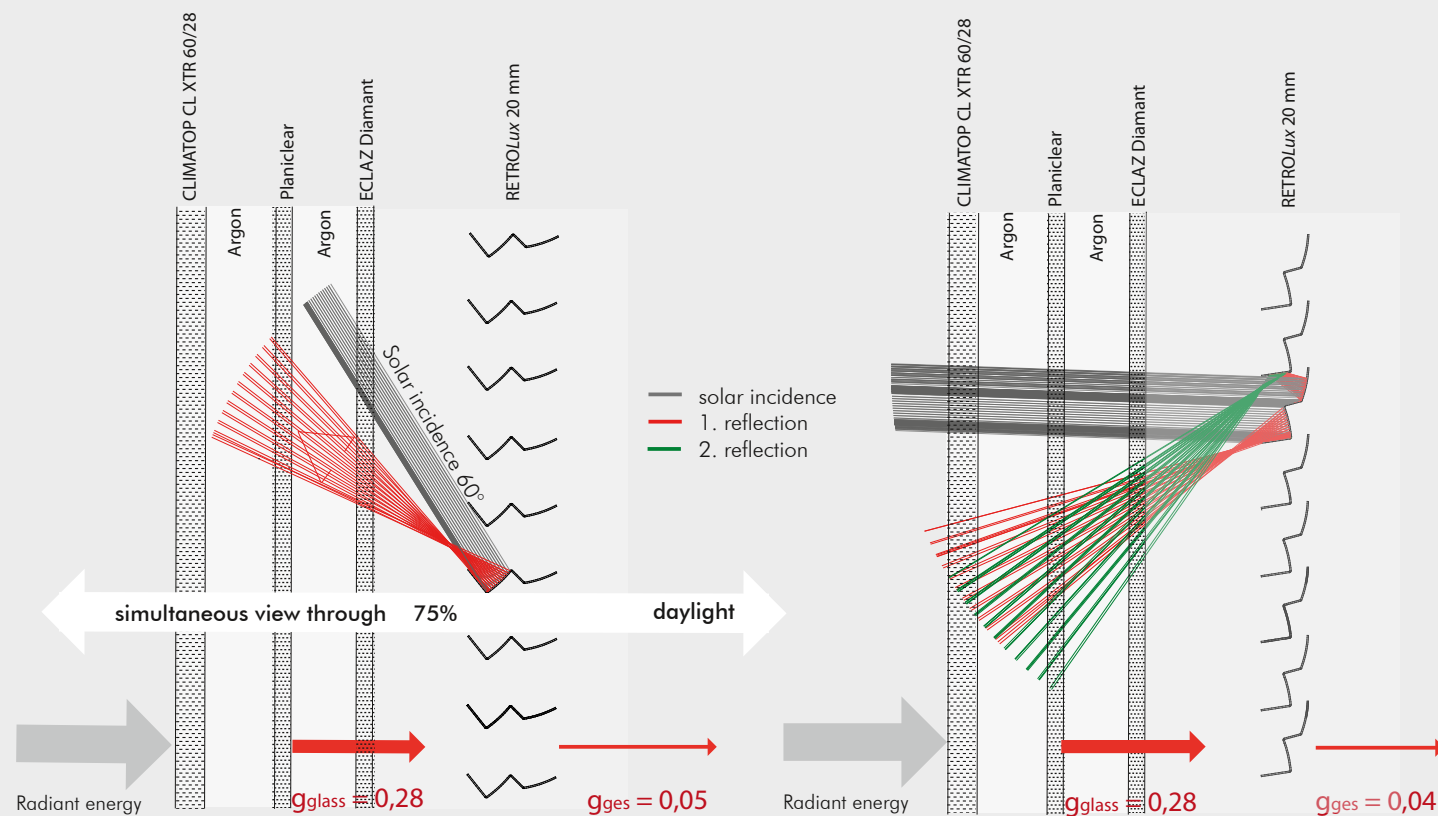
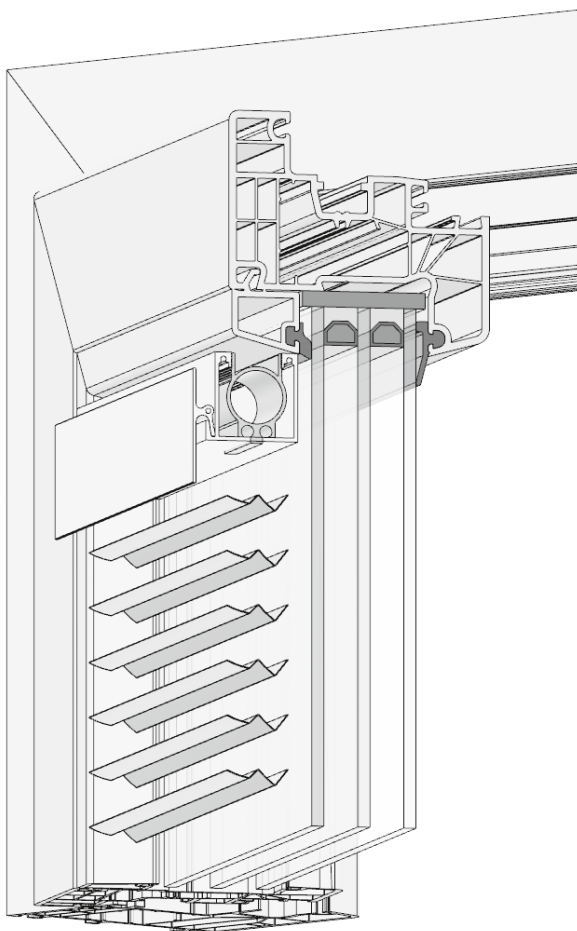
$$g_{ges} = 0,05$$

Measurement according to EN DIN410 with open blinds and during high summer sun.

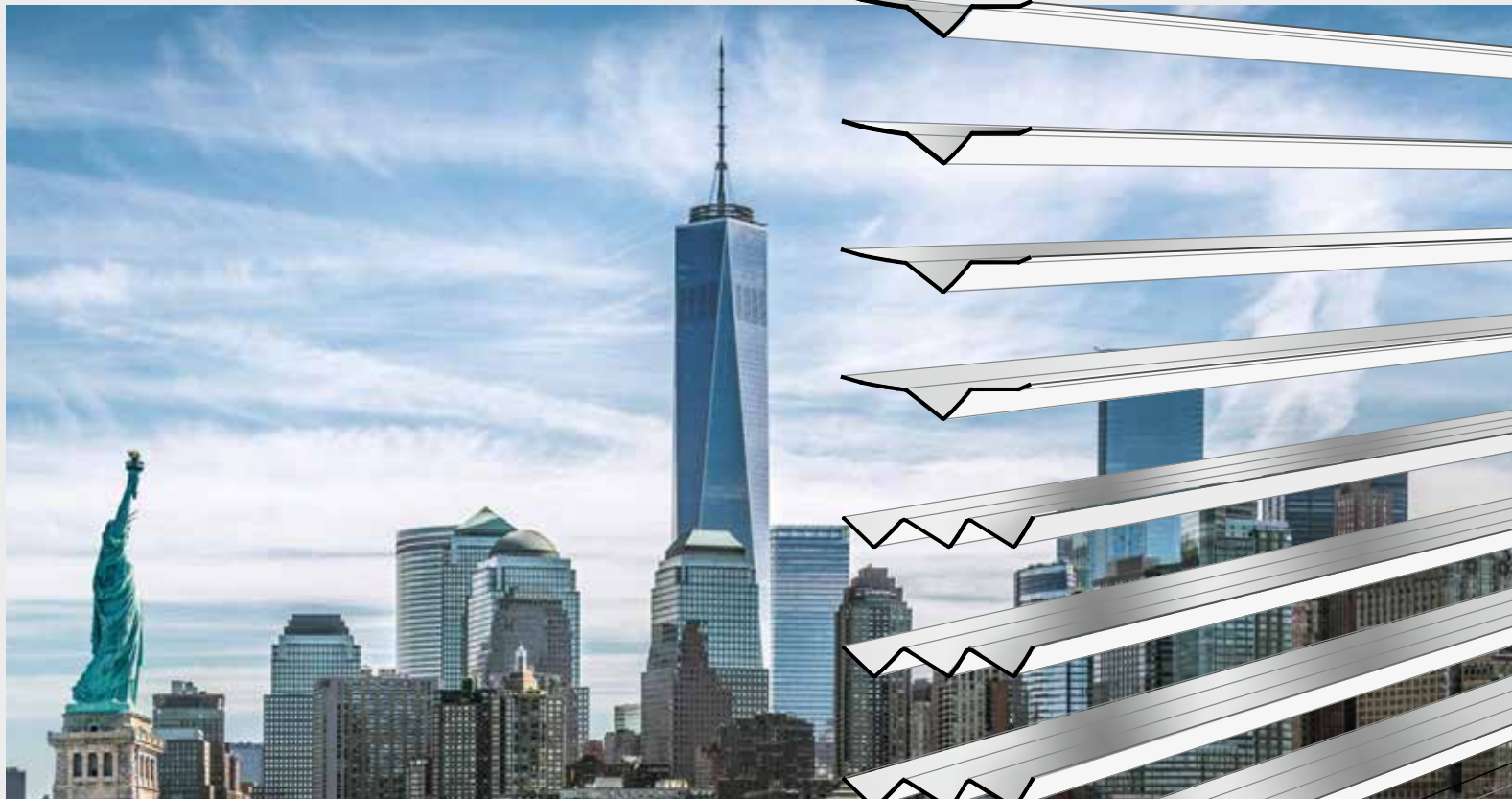
The low total energy transmission of only 5% results from the monofocal light control and a surface reflection of the slats of 96%.

$$g_{ges} = 0,04$$

Measurement according to DIN with closed blinds and horizontal solar irradiation. This low energy input is achieved by the ability of the reflectors to reflect the long-wave radiation from the glass at > 94 %. The interior is released from thermal stress.



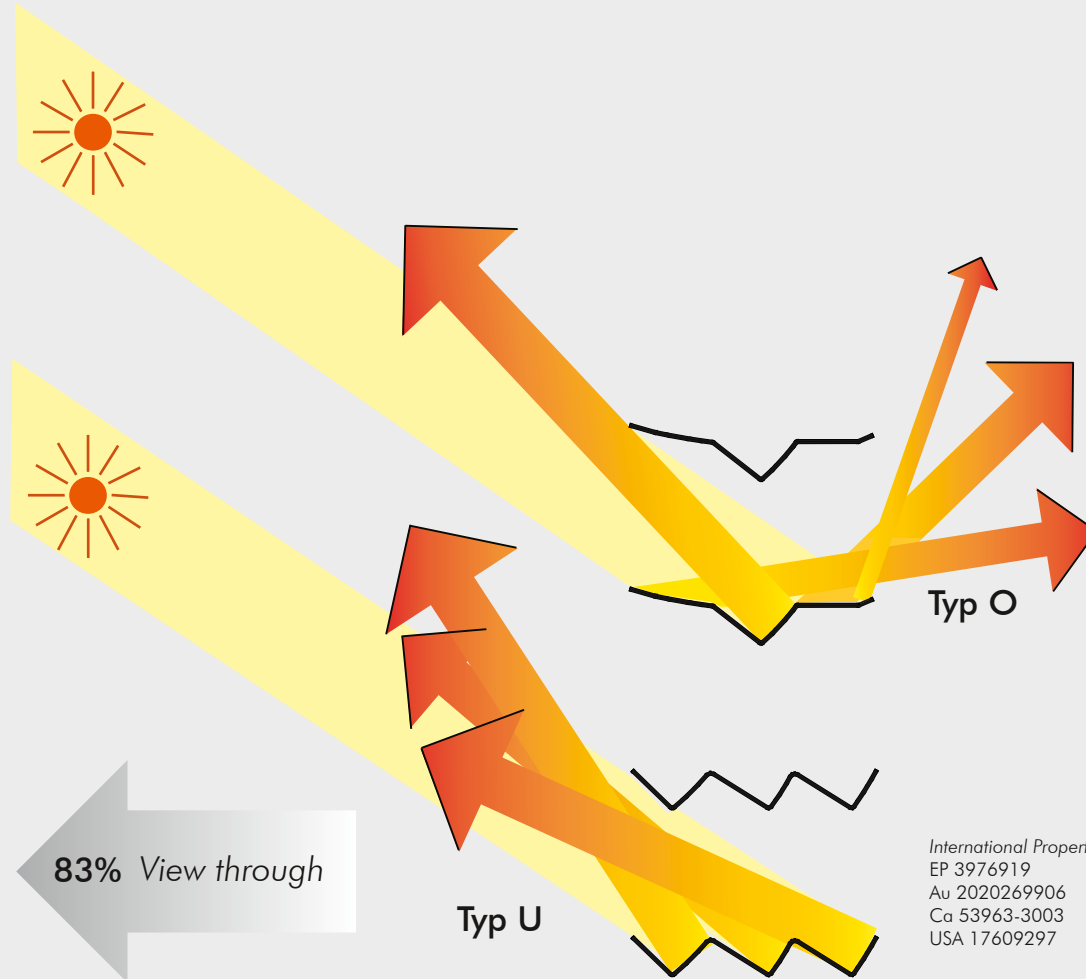
RETROLux 25 mm



Three in One:

- View through
- Deep room illumination
- Solar- and glare protection

Improves room illumination even on an overcast sky



RETROLux 25 mm

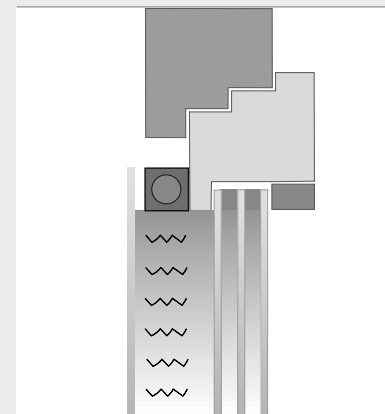
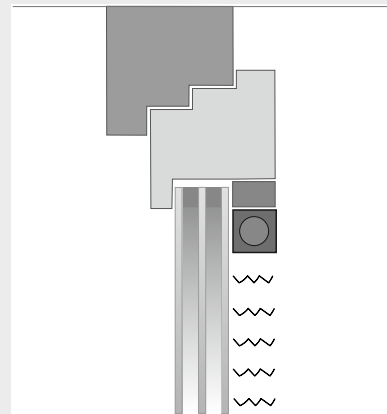
The 25 mm RETROLux louvers have comparable light guidance and functionality to the 75mm louver.

Type O captures also zenith light and improves the room depth illumination in the interior depth.

Type U deflects all incident radiation back into the sky without glare and without causing thermal stress to the interior or the street.

International Property Rights
EP 3976919
Au 2020269906
Ca 53963-3003
USA 17609297

In the customer evaluation, the most important criterion of a sun shading system is the simultaneous view through.

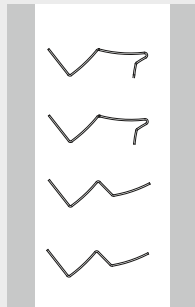


The RETROLux 25mm louver blind is preferably suitable for glazing bead installation in the window or for external installation behind an additional external pane.

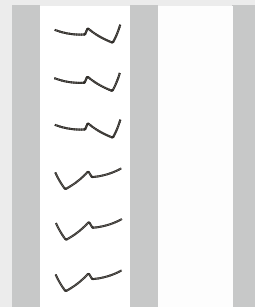
RETROLuxTherm



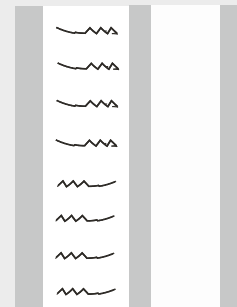
RETROLuxTherm 20
for interior blinds and
compound windows



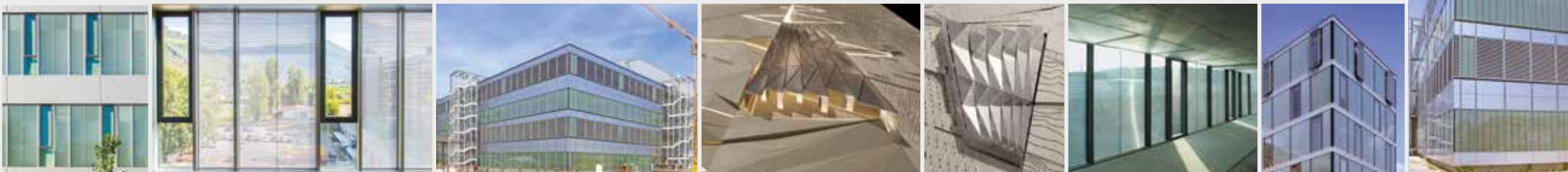
RETROLuxTherm 12 macro
for insulating glass
in fixed position



RETROLuxTherm 12 micro
for insulating glass
in fixed position

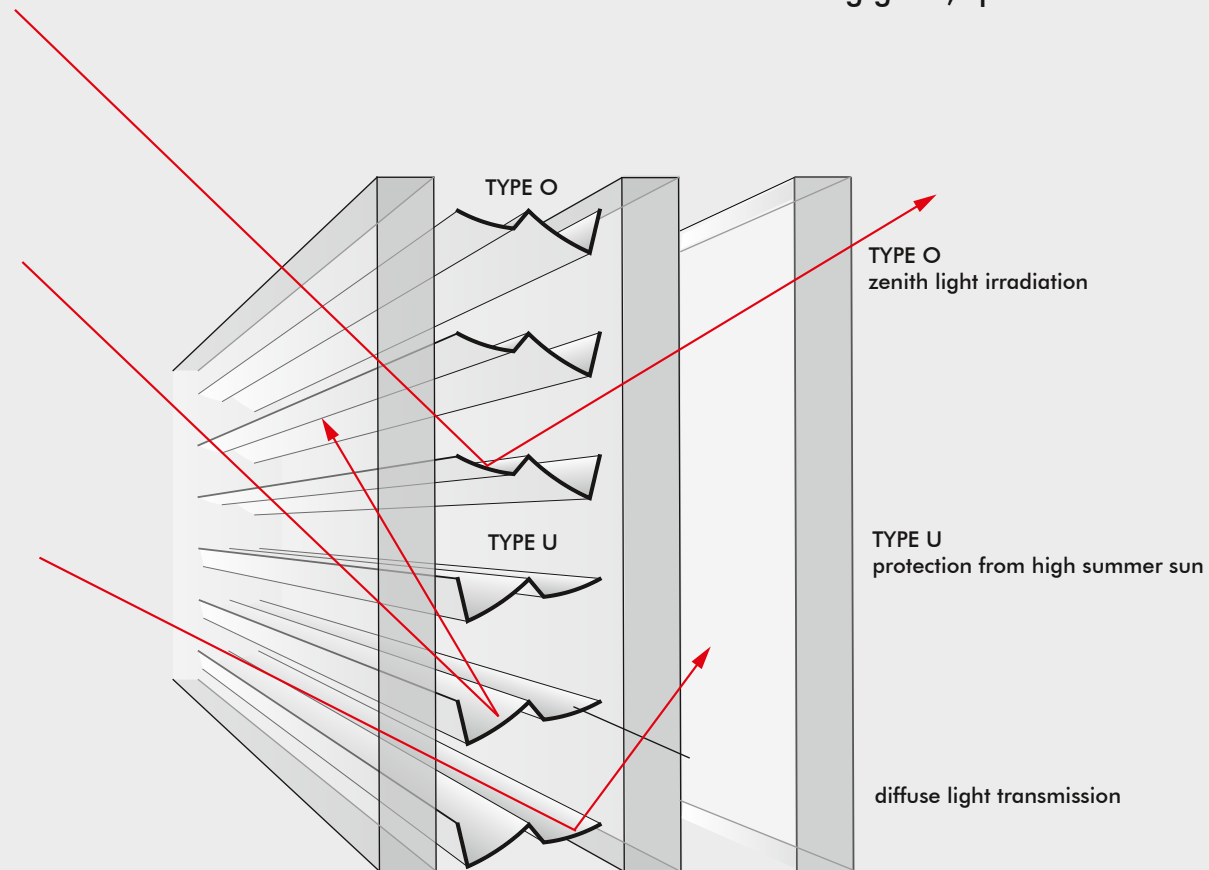


Bifocal light redirecting louvers
Light deflection- and reflection function
Solar protection
Improved daylighting
Fixed systems in facades



RETROLuxTherm, *macro*

louver width 12mm for insulating glass, spacer min. 18 mm

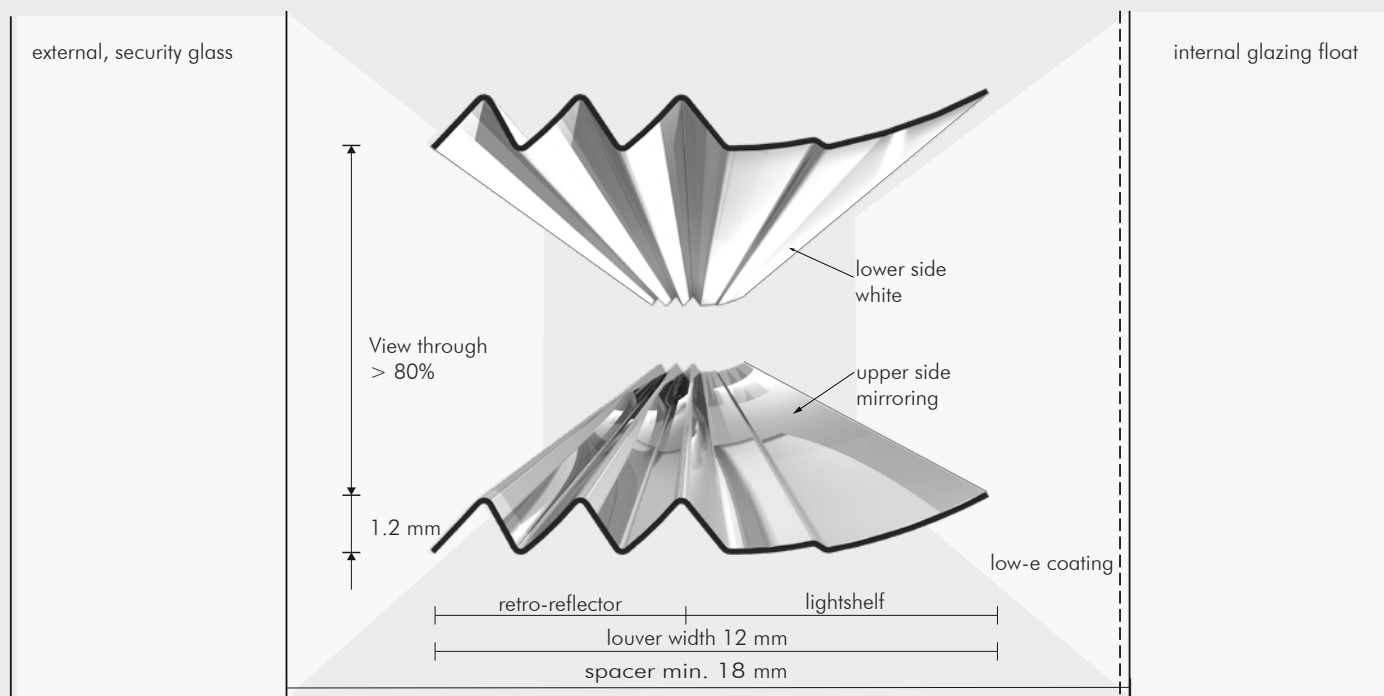


RETROLuxTherm louvers in fixed arrangement
with zenith light irradiation by multifocal optics:

- upper window area: gain of zenith light in room depth
- lower window area: protection from high summer sun
- excellent view through due to horizontal position of the louvers
- maintenance free due to fixed installation, no aging

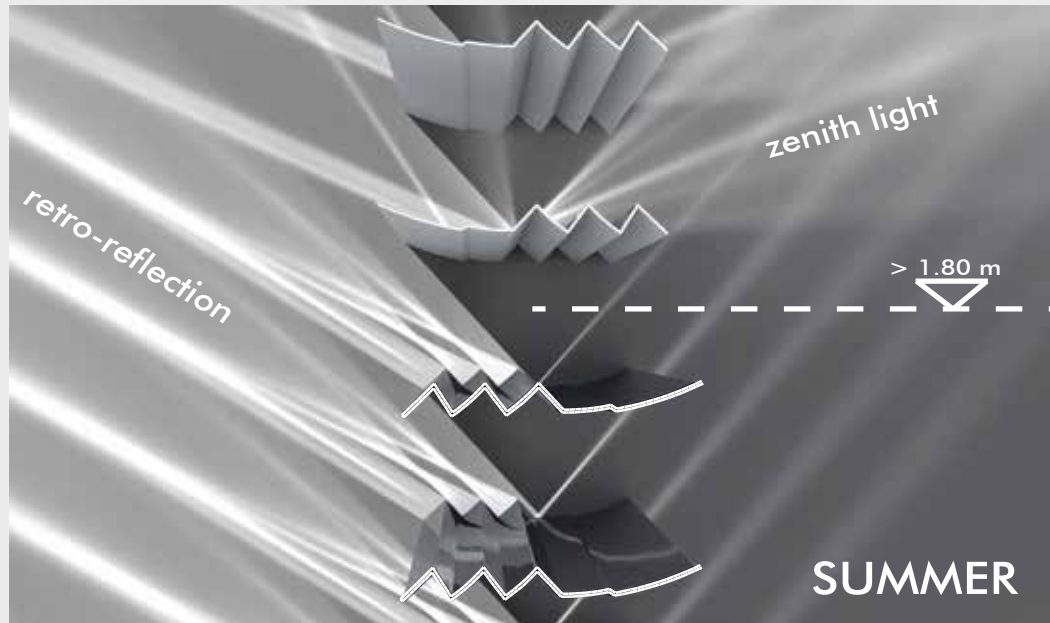
RETROLuxTherm, *micro*

louver width 12 mm for insulating glass, spacer min. 18 mm



Advantages:

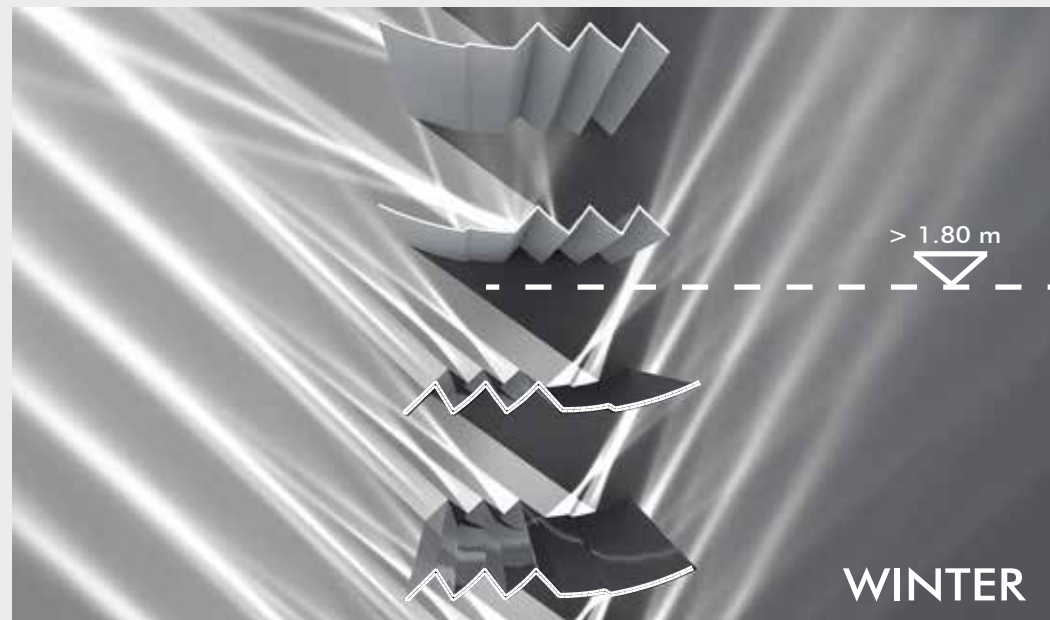
- The slats with a height of approx. 1.2 mm are no longer visible from a larger distance, therefore
- unobstructed view through
- particularly recommended for administrative buildings, clinics, banks, schools
- as fixed systems in insulating glass
- maintenance-free, no aging



RETROLuxTherm, *micro*

optics of bifocal mirror louvers

multifocal louver arrangement, gain of zenith light



RETROLuxTherm micro

TYPE O

upper window area:
with zenith light irradiation
into room depths

7.8 mm

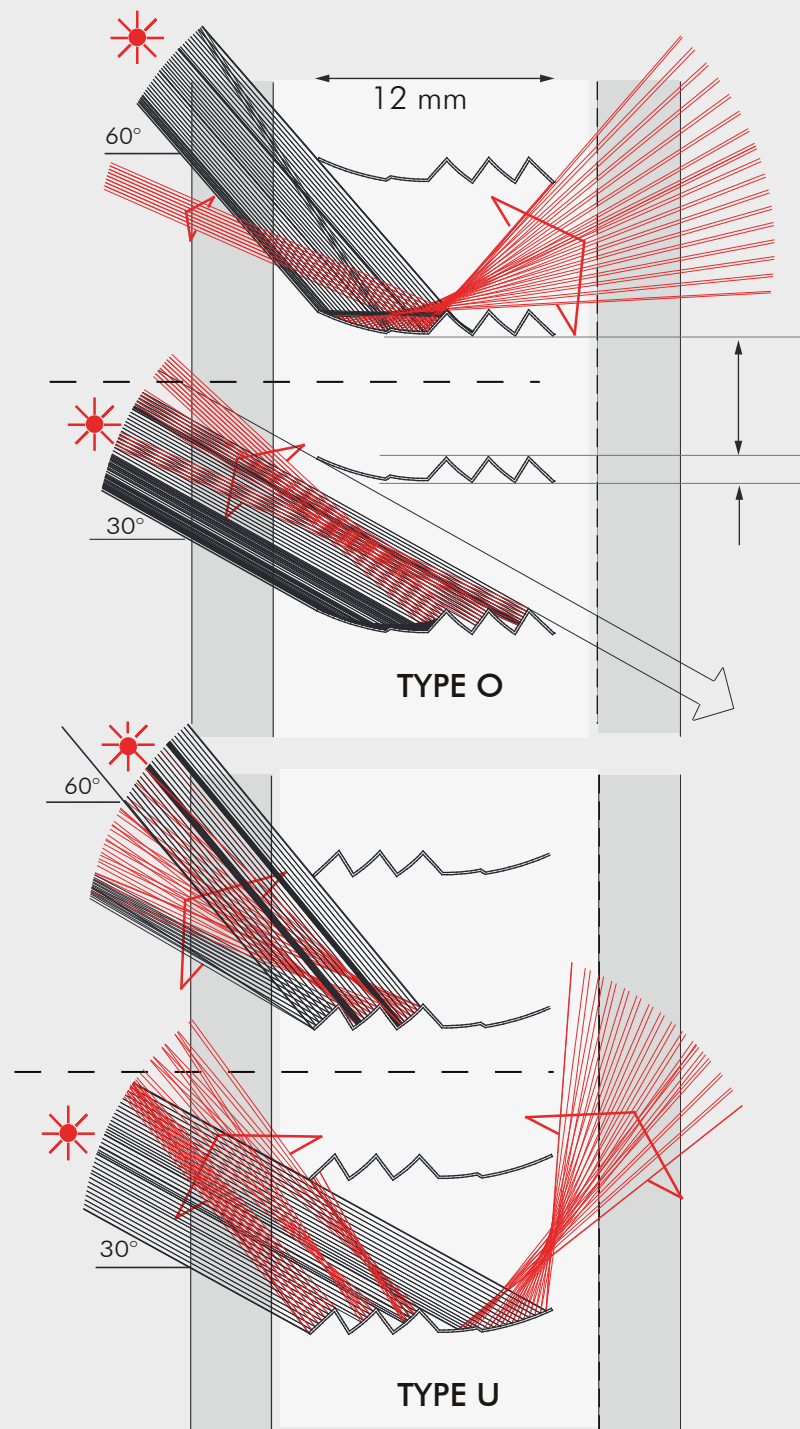
1.2 mm

Excessive energy irradiance in
summer is retro-reflected
back into the sky

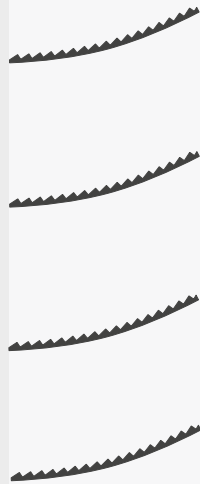
TYPE U

lower window area:
primarily protection from overheating
retro reflection of the high summer sun

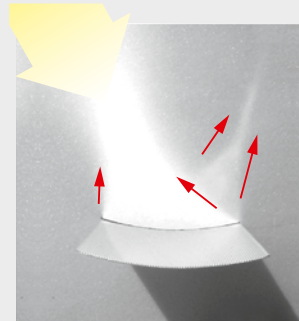
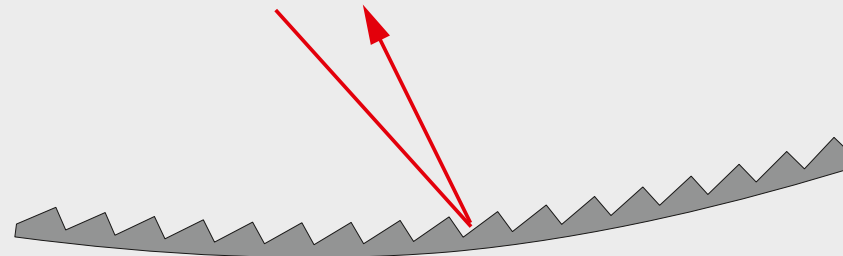
diffuse light transmission
partial gain of the lower sun
glarefree light redirection
onto the ceiling
partial retro-reflection of
the excessive energy



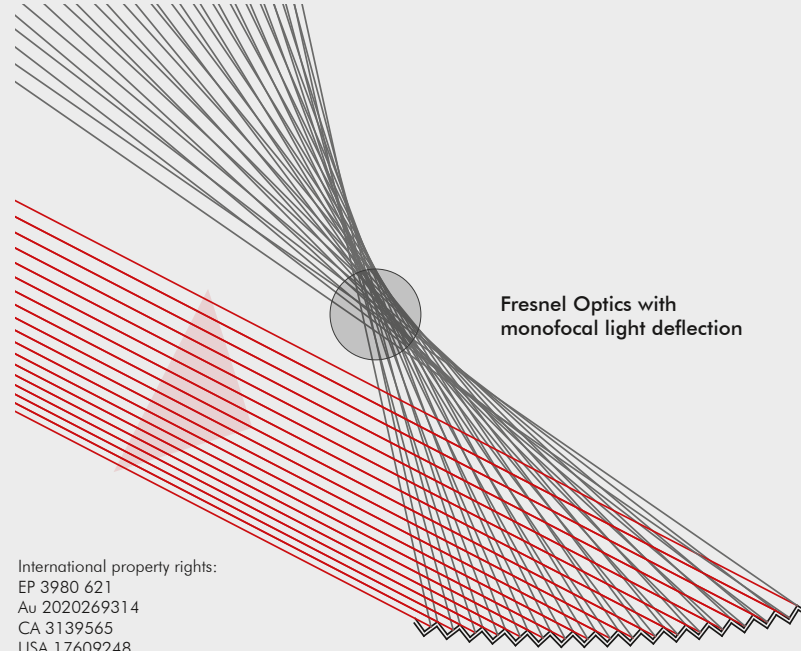
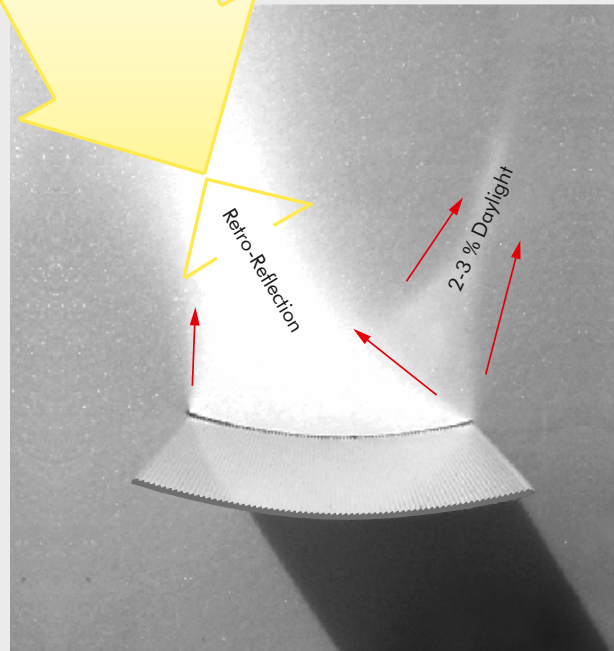
RETROFlex, External



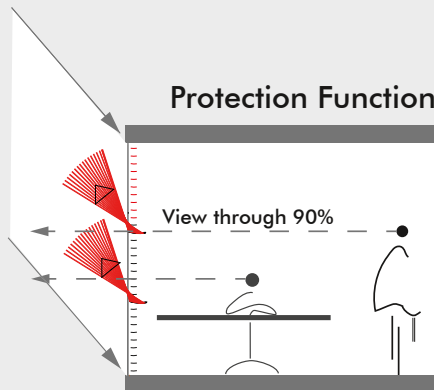
monofocal light redirecting louvers,
solar protection by retro-reflection
in open louver position,
improved daylighting,
for mono and double skin facades



RETROFlex with Fresnel Optics

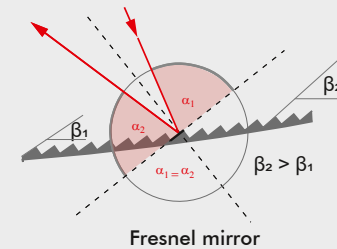


International property rights:
EP 3980 621
Au 2020269314
CA 3139565
USA 17609248



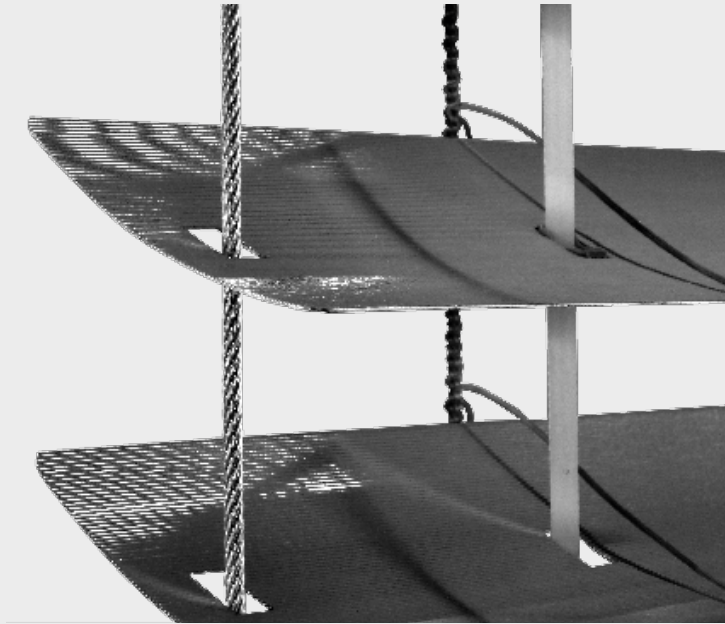
RETROFlex 16 mm - 80 mm Application internal or in facade cavities

- monofocal light deflection louvers with Fresnel mirror
- protection from overheating by retro-reflection
- optimized view through due to
- active protection function in horizontal louver position
- improved room illumination and
- diffuse light transmission

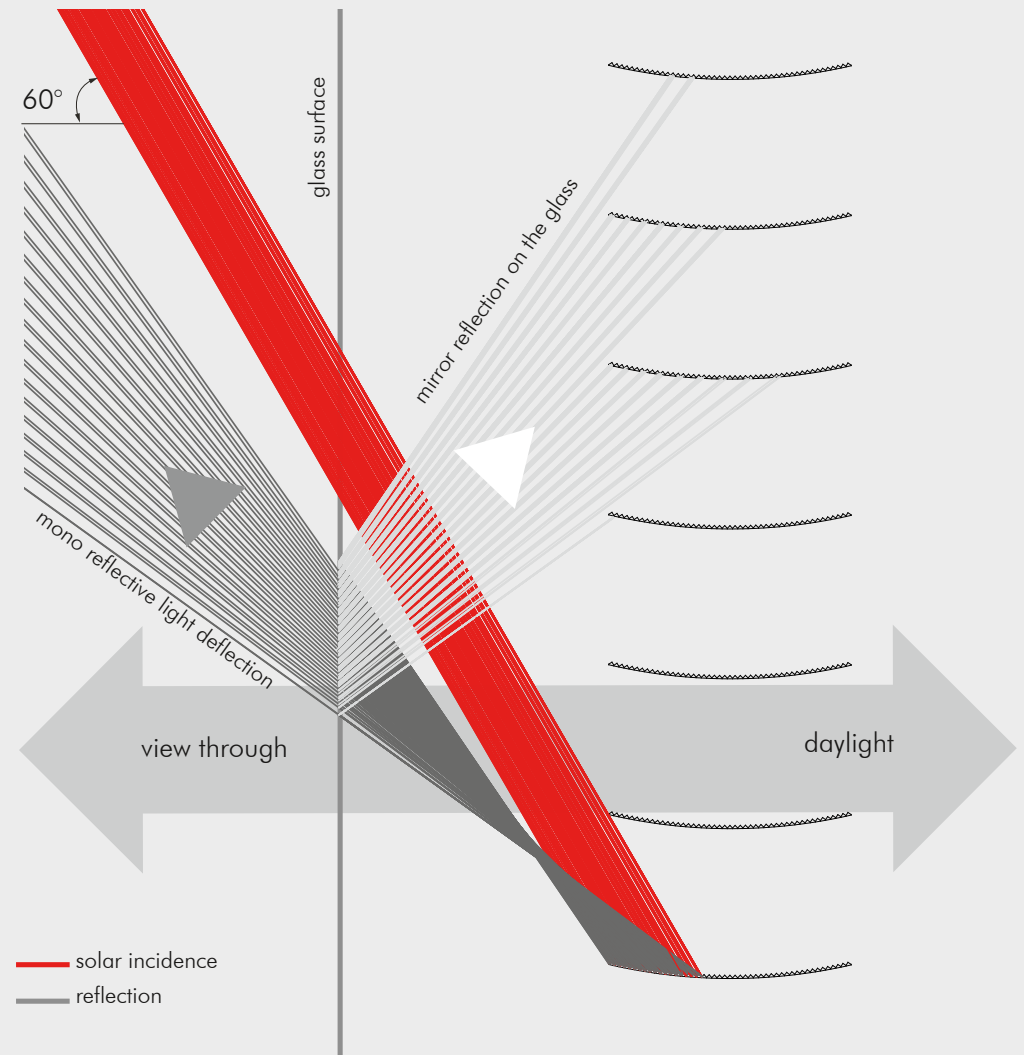


RETROFlex

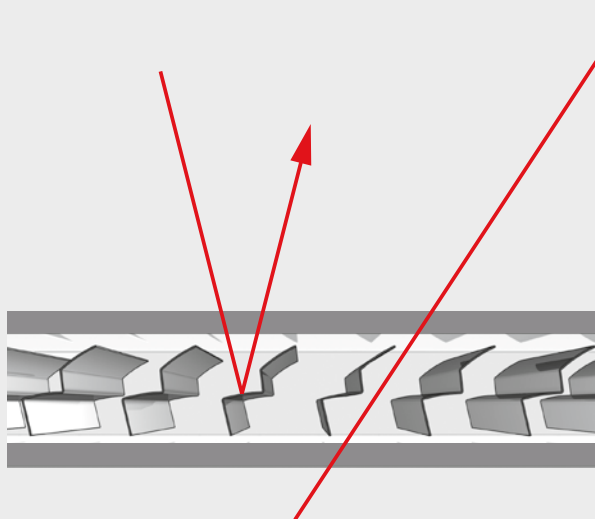
louver width between 16mm and 80 mm



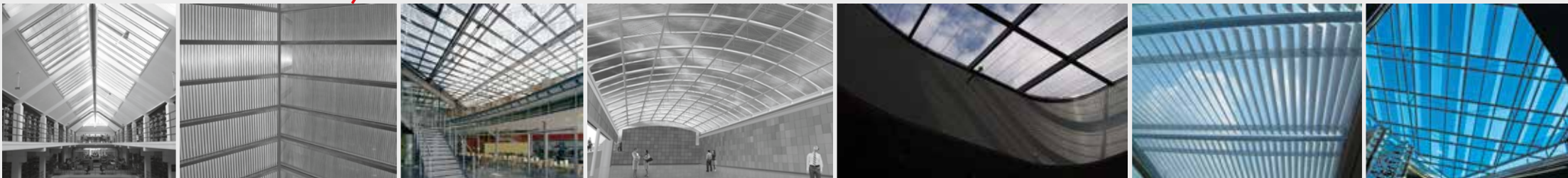
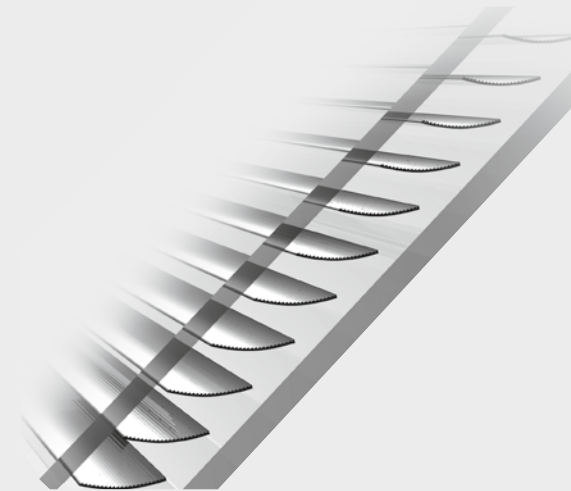
- louver upper side: microstructured Fresnel mirror
- louver lower side: white, mat
- louver guidance by tension cable available
- blind lifting by tapes or cords
- mirror glare from the glass avoided
- reflections are blocked on the underside of the louvers
- light deflection to outside, glare-free
- due to light deflection back into the sky overheating of the local city climate is avoided



RETRORoof



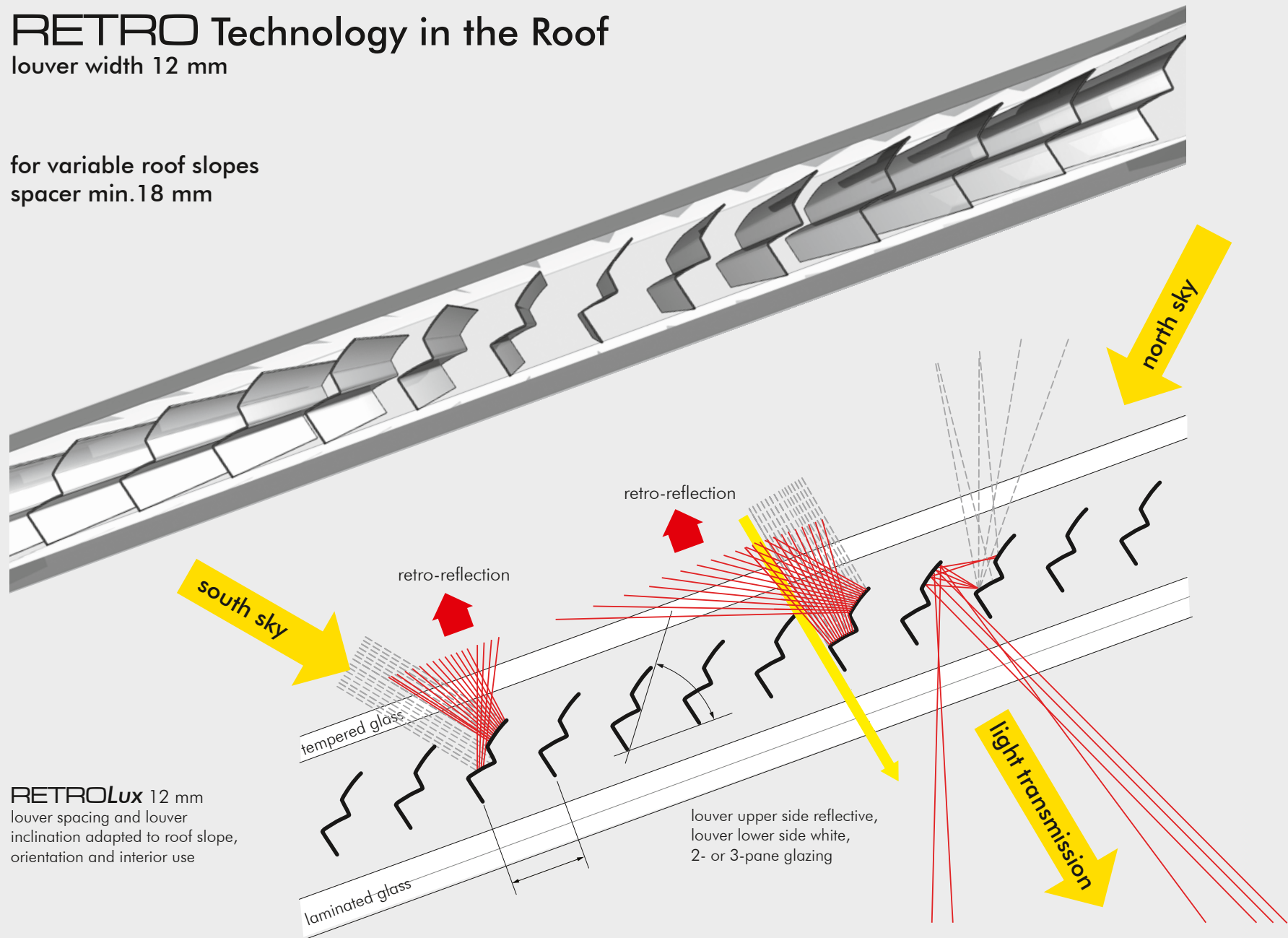
Micro and macro structured light redirecting louvers
with light deflection- and reflection function
as solar- and heat protection,
improved view through,
systems fixed, maintenance free



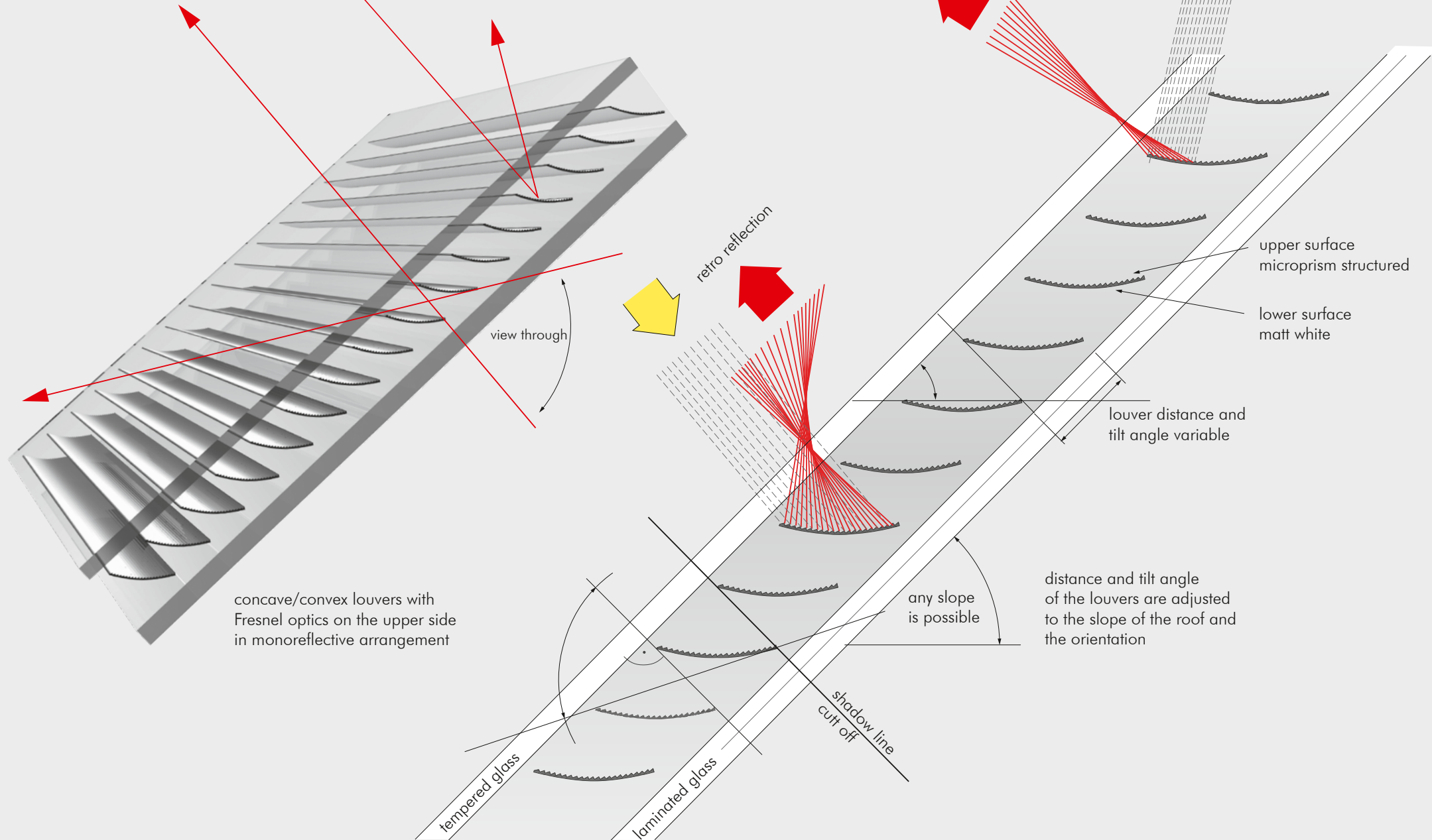
RETRO Technology in the Roof

louver width 12 mm

for variable roof slopes
spacer min. 18 mm



Strategies of Light Management





in cooperation with **DR. KÖSTER** LICHTPLANUNG