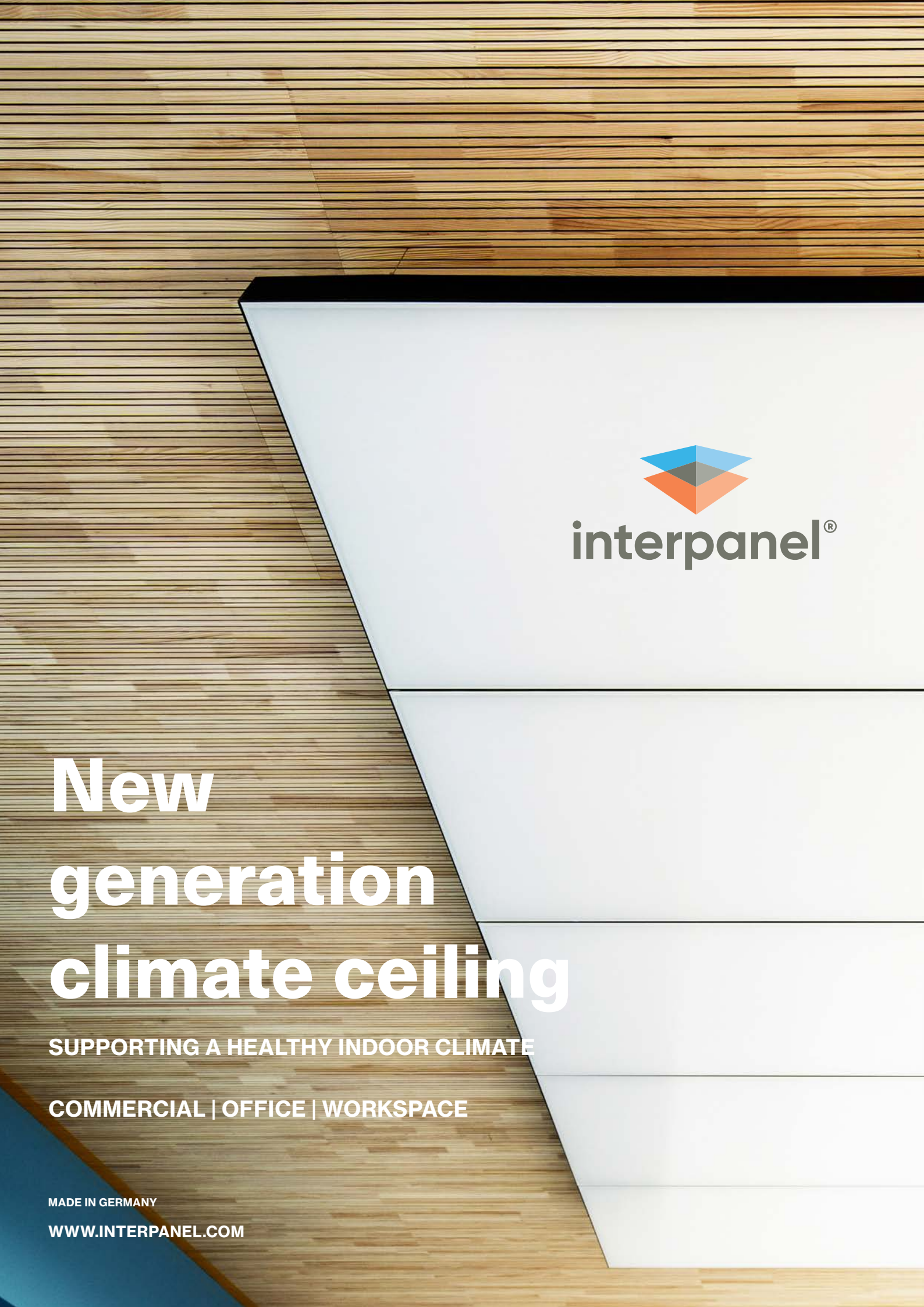


New generation climate ceiling

SUPPORTING A HEALTHY INDOOR CLIMATE

COMMERCIAL | OFFICE | WORKSPACE

MADE IN GERMANY

WWW.INTERPANEL.COM

Our inspiration

A healthy indoor climate

Climate change is one of the most pressing problems of our time. Due to the combination of increasing urbanisation, extreme heat waves, and increasing standards of comfort worldwide, over 4,600 million new air conditioners will be required for approx. 3 billion people by the year 2050. Inefficient air conditioning contributes to the consumption of massive amounts of energy for the cooling, transporting, and dehumidification of air. What is often insufficient maintenance of the systems further worsens their efficiency and also results in potential negative health effects in living, working, and healthcare spaces.

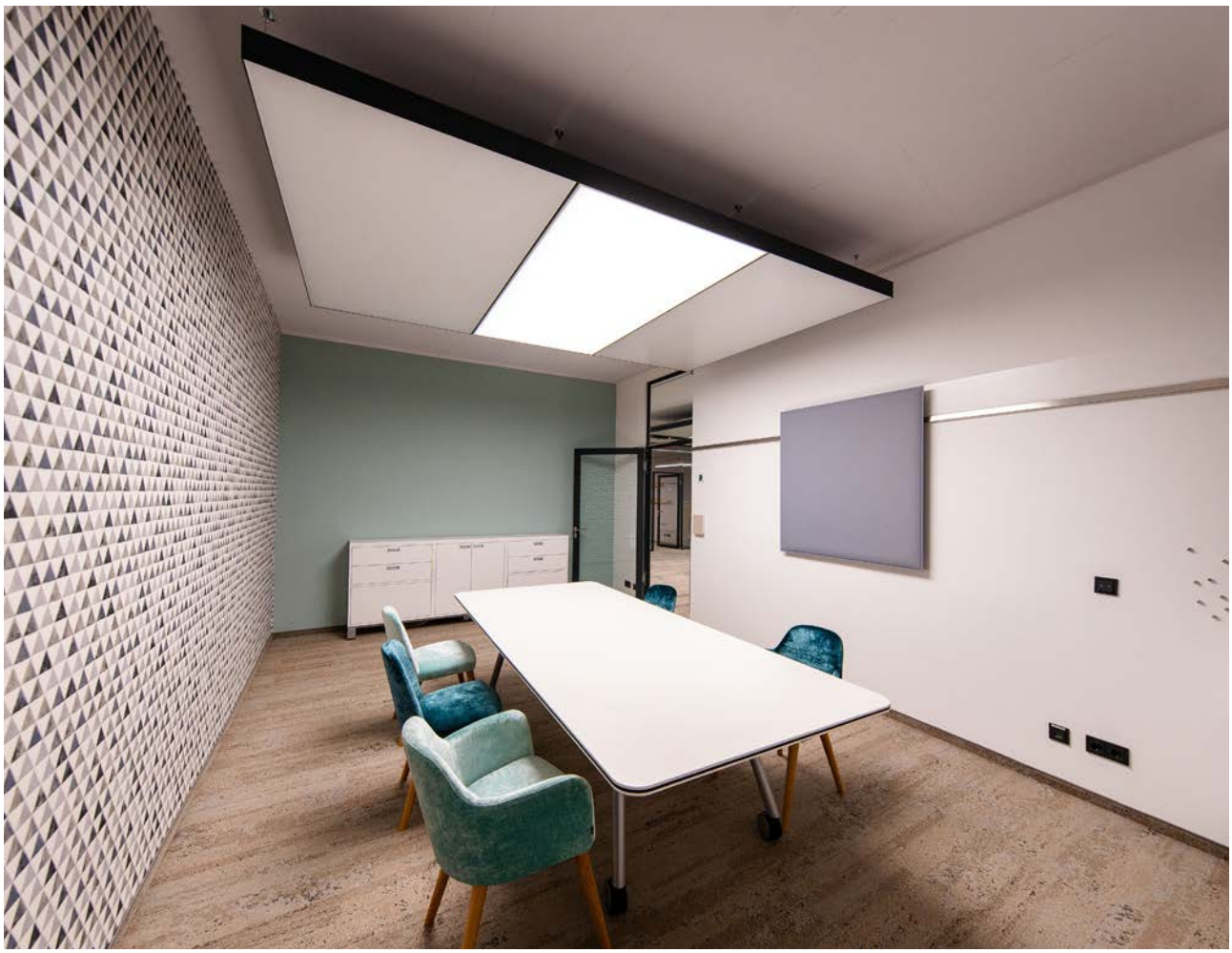
As an innovative space heating and cooling technology, efficient and convenient panel-based climate control systems still play a niche role. As a maintenance-free, high-performance, and healthier alternative to air conditioning, the technology has until now seen limited use due to the issue of the dew point – the condensation of moisture in the air on the cooled surface. The therefore insufficient cooling performance and complexity resulted in the "airless" heating system being unfeasible on a global scale.

interpanel overcomes these obstacles. interpanel's silent space heating system is the first to function independently of the dew point temperature of the ambient air. By utilising renewable energy sources, the technology makes possible a climate-neutral and positive influence on our well-being in living and working spaces. The key decision-making criterion of how humans perceive sensations has taken centre stage.

Building on this, interpanel develops systematic overall solutions which can be realised in a lean process. Possible applications include both new and existing buildings, in retail and exhibition spaces, board areas, co-working spaces, but also in industrial settings, hospitals, nursing homes, and open-plan offices.

The interpanel founders –
Alexander Buff and Daniel Himmel

Content



The solution for workspaces

Systematically achieving a healthy, productive indoor climate

Our mission is to create living and working spaces with a healthy indoor climate while eliminating complaints and illnesses arising from cold air and climate control factors.

The technologies developed by interpanel are based on principles which optimally take into account the physiological perception of humans. All interpanel systems can be combined with renewable energy, heat, and cold sources, thereby functioning as active and passive systems.

interpanel is the solution for clients, planners, architects, and users when a natural and comfortable indoor climate with a sophisticated look and technology needs to be created in a straightforward fashion.

The exceptional product design offers unparalleled functional performance values for all major climate control and visual requirements.

interpanel® is a manufacturer and systems provider, and develops, produces, and distributes the multi-functional system solutions.

Importance of a healthy indoor climate

THE COOLING CHALLENGE

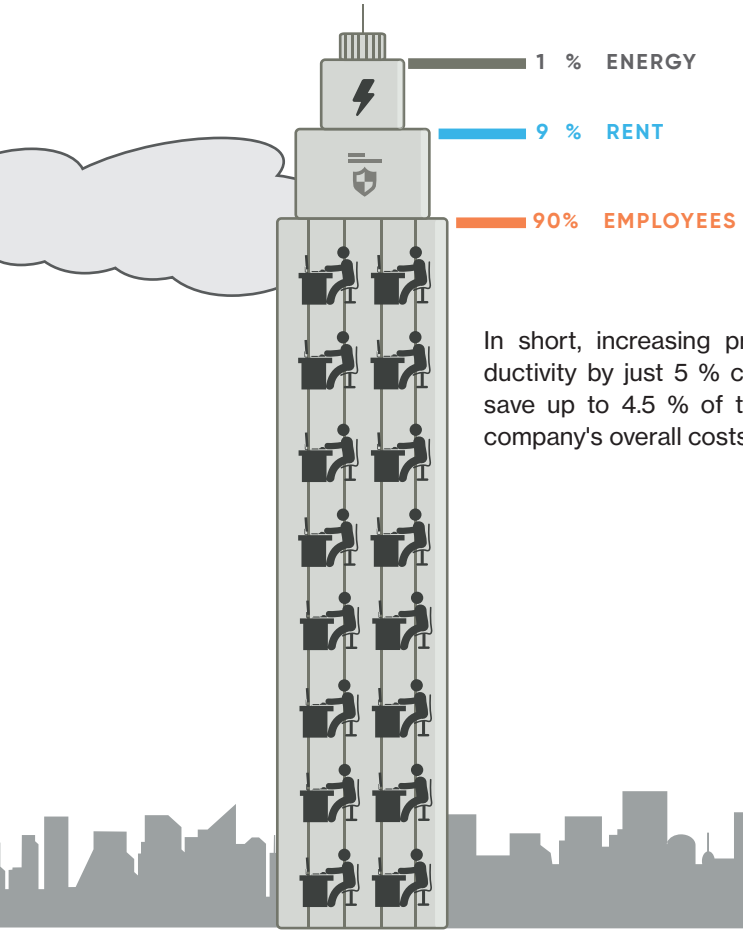
Since heating and climate control technology became available in buildings, it has been possible to create defined conditions under which people feel comfortable.

It has been demonstrated that people in industrialised nations spend up to 90% of their lives in indoor spaces. A significant portion of this time is spent at the workplace. For optimal performance, it is therefore necessary in modern working environments to satisfy the human need for a balanced indoor climate.

Managing the room temperature in summer is often a challenge that is solved using full-fledged air conditioning. However, numerous studies show that up to 60% of users in office spaces are dissatisfied with this approach. Cold drafts, noise, as well as the whirling up of dust and germs are just a few factors for this dissatisfaction.
Sophisticated workspaces that are equipped with the latest climate control technology ensure improved concentration and performance.

Investing in a favourable indoor climate, taking into account improved employee productivity, pays off by a factor 10.

TYPICAL DISTRIBUTION OF THE COSTS OF BUSINESS IN A COMPANY



In short, increasing productivity by just 5 % can save up to 4.5 % of the company's overall costs.

Success factor

The right indoor climate

Thanks to the integration of the latest climate control technology, it is now possible to cater to user-specific needs at all times, even when special requirements need to be met. With the silent and draft-free temperature control, significant cost savings can be achieved while providing a comfortable indoor climate.

A comfortable indoor climate improves productivity.

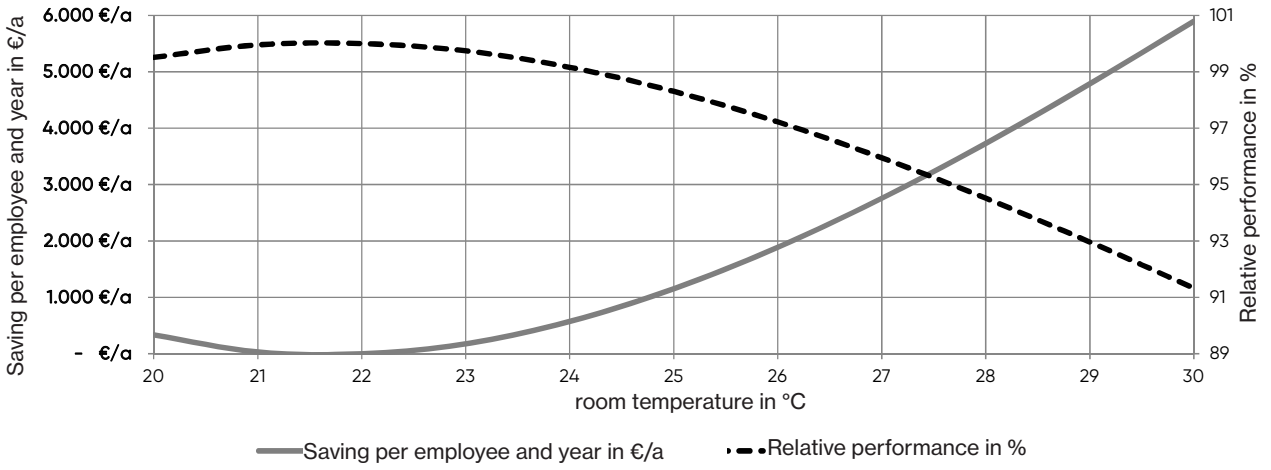
Particularly at higher indoor temperatures exceeding 26°C, the loss of productivity and error rates increase disproportionately, as many representative studies have shown. The diagram based on scientific experiments offers a clear prognosis.

Cooling the workplace from 28°C to 22°C achieves savings of approx. €3,700 per year and employee. The energy costs for a full business year amount to approx. €63 per year and employee.* Over a typical Central European summer, this results in energy costs of approx. €24 per year and employee for maintaining a favourable indoor climate.

Temperature in °C	24 °C	27 °C	29 °C	32 °C	35 °C
Loss in work productivity in %	3%	8%	18%	29%	45%
Increase in error rate in %	0%	5%	40%	300%	400%

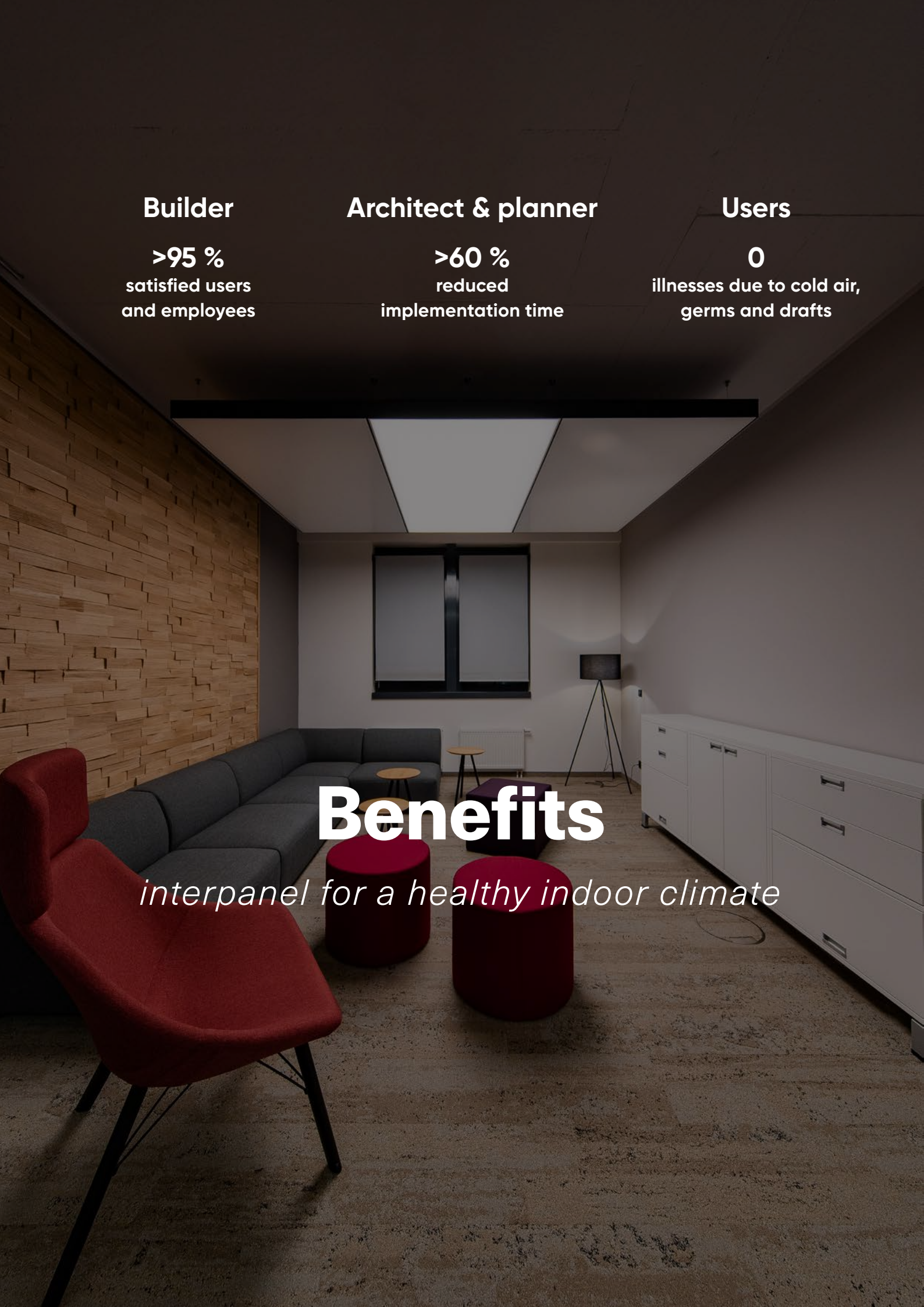
NASA HEAT STRESS STUDY CR-1205

Savings in terms of personnel costs due to overly low or high indoor temperatures*



*210 working days x 8 h of cooling, 2-person office, 6 kWh_{th}/day, COP 3 (air-to-water heat pump), € 0.3/kWh = €63/person

Berkeley Lab, A U. S. Department of Energy National Laboratory Managed by the University of California, https://iaqscience.lbl.gov/performance-cost



Builder

>95 %
satisfied users
and employees

Architect & planner

>60 %
reduced
implementation time

Users

0
illnesses due to cold air,
germs and drafts

Benefits

interpanel for a healthy indoor climate

The new generation climate ceiling

One standard for your needs

interpanel®

Climatelight | Climatepanel | Acousticlight

COOLING & HEATING

+136 W/m²

Up to 6°C inlet temperature

Without dew point sensor

+92 W/m²

Low heating temperature

Infrared heating

LIGHT

3000 – 6500 K
CRI 80+ to 95+
15 000 lm

ACOUSTICS

α_w: 0.85 – 1
Flame-resistant
Custom colour scheme

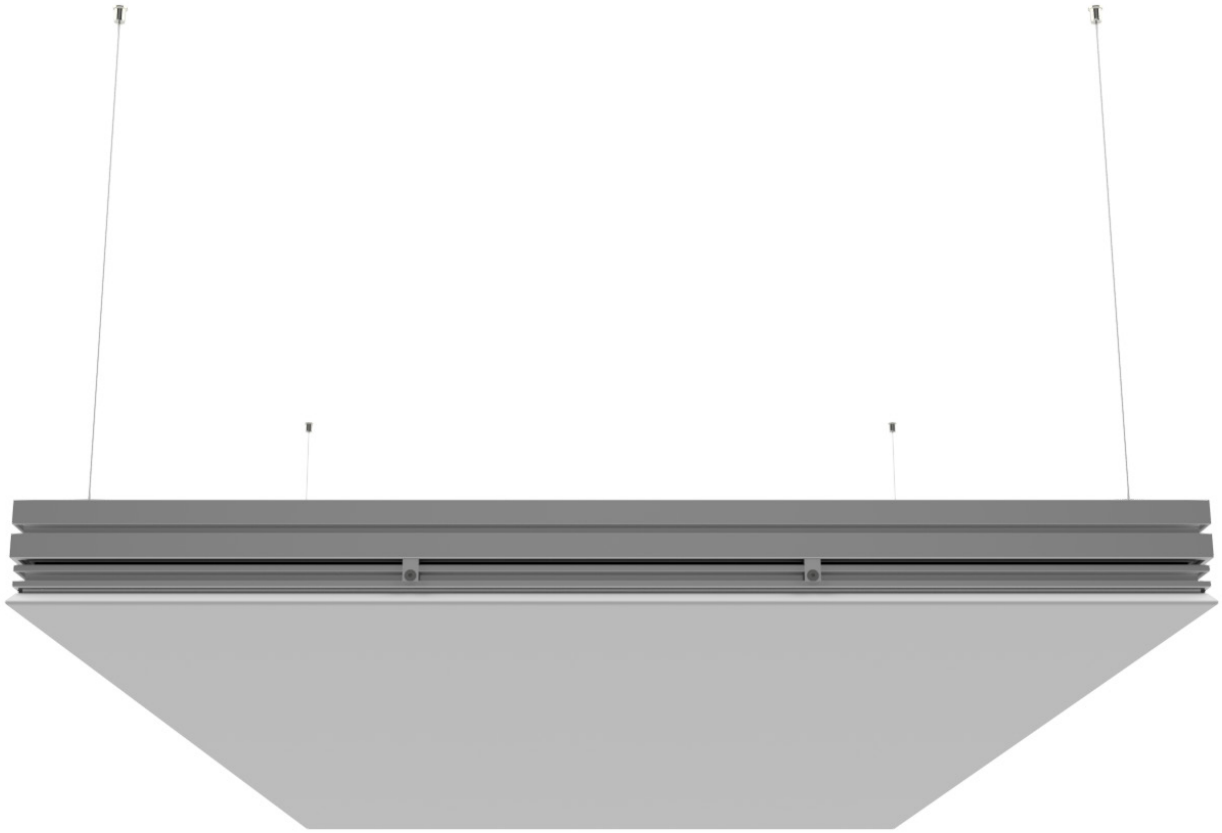
MEASUREMENT AND CONTROL TECHNOLOGY

KNX – DALI – EnOcean – Bluetooth | Room-specific or centralised

interpanel® Climatelight

Cooling, heating, acoustics, and light

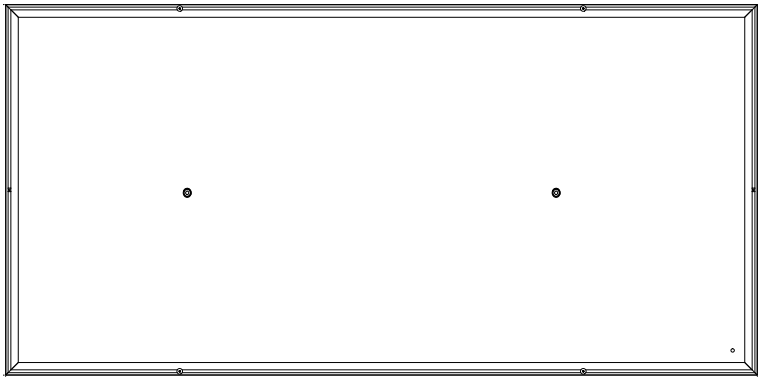
Characteristics	
Weight in kg/m²	13
Dimensions L x B x H in mm	2159*1064*100
Area in m²	2.3
Structural height in mm	100 – 150



Views

FUNCTION	CLIMATELIGHT	CLIMATEPANEL	ACOUSTICLIGHT
Cooling	X	X	
Heating	X	X	
Light	X		X
Acoustics	X	X	X
Frame colour	X	X	X

SIDE VIEW, LONGITUDINAL



TOP VIEW

BOTTOM VIEW

SIDE VIEW, LATERAL

FORMAT WITHOUT FRAME

L	B	H
2159	1064	94 mm

FORMAT WITH FRAME

L	B	H
2163	1068	100 mm

FORMAT WITH ACOUSTICS

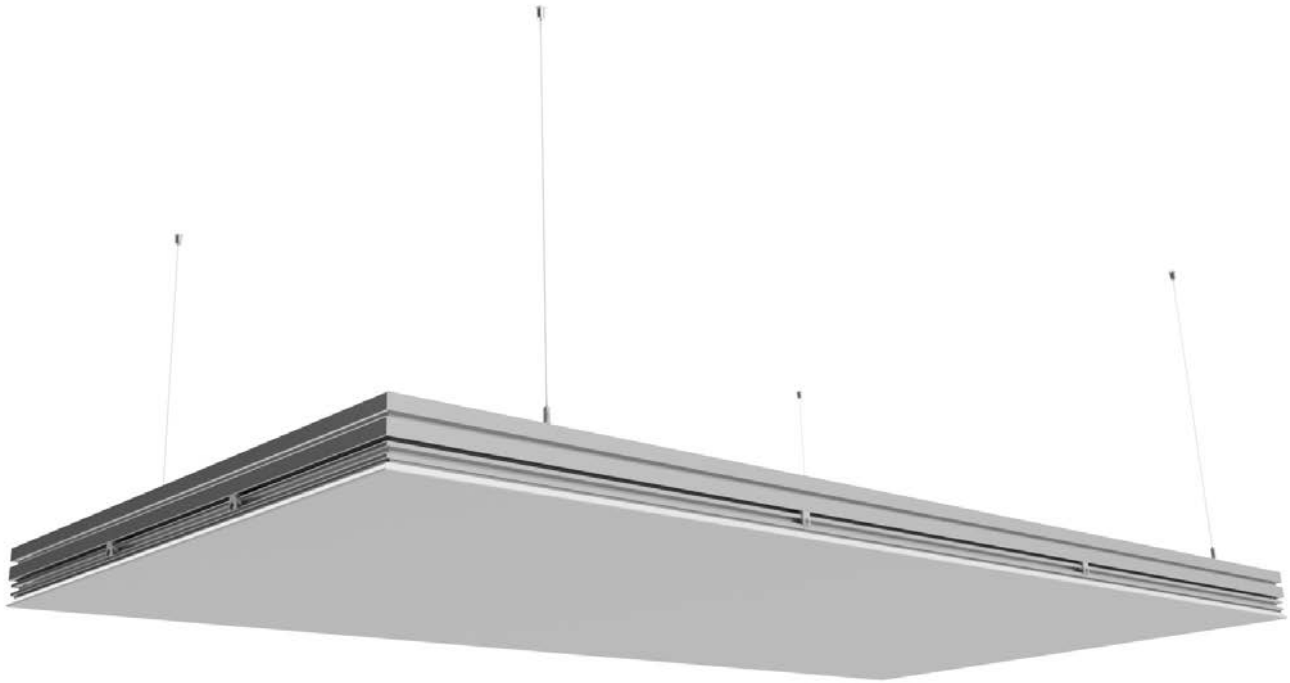
L	B	H
2163	1068	150 mm

interpanel® Climatepanel

Cooling, heating and acoustics

Characteristics	
Weight in kg/m²	12
Dimensions L x B x H in mm	2159*1064*100
Area in m²	2.3
Structural height in mm	100 – 150

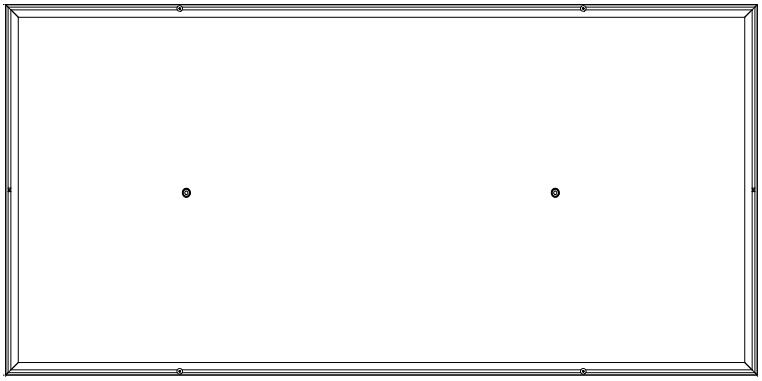
COOLING + HEATING + ACOUSTICS



Views

FUNCTION	CLIMATELIGHT	CLIMATEPANEL	ACOUSTICLIGHT
Cooling	X	X	
Heating	X	X	
Light	X		X
Acoustics	X	X	X
Frame colour	X	X	X

SIDE VIEW, LONGITUDINAL



TOP VIEW

BOTTOM VIEW

SIDE VIEW, LATERAL

FORMAT WITHOUT FRAME

L	B	H
2159	1064	94 mm

FORMAT WITH FRAME

L	B	H
2163	1068	100 mm

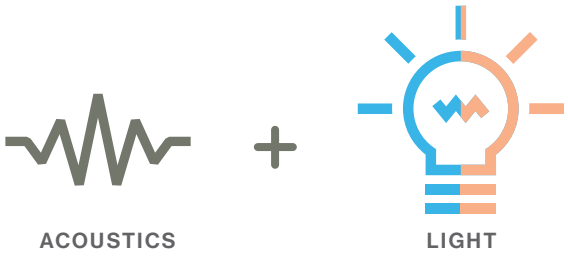
FORMAT WITH ACOUSTICS

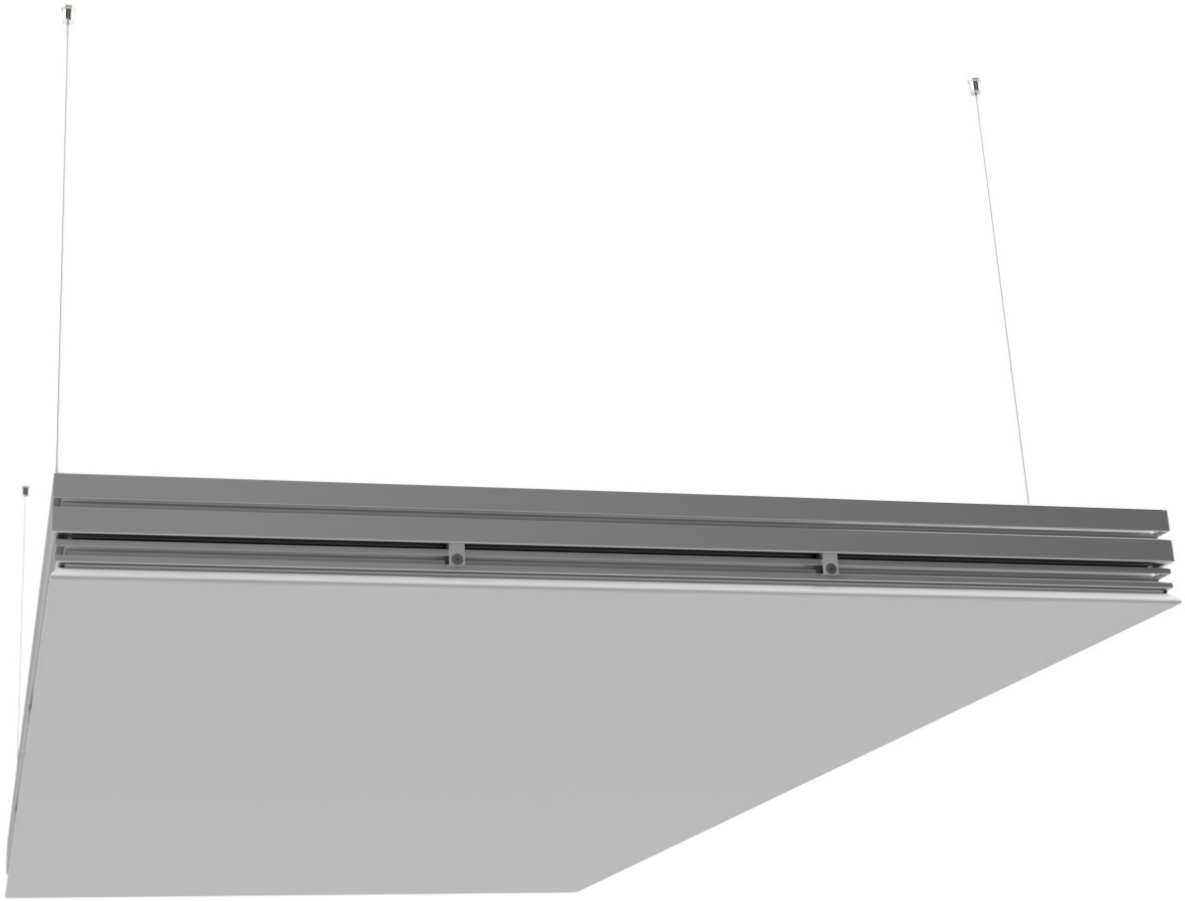
L	B	H
2163	1068	150 mm

interpanel® Acousticlight

Light and acoustics

Characteristics	
Weight in kg/m²	13
Dimensions L x B x H in mm	2159*1064*100
Area in m²	2.3
Structural height in mm	100

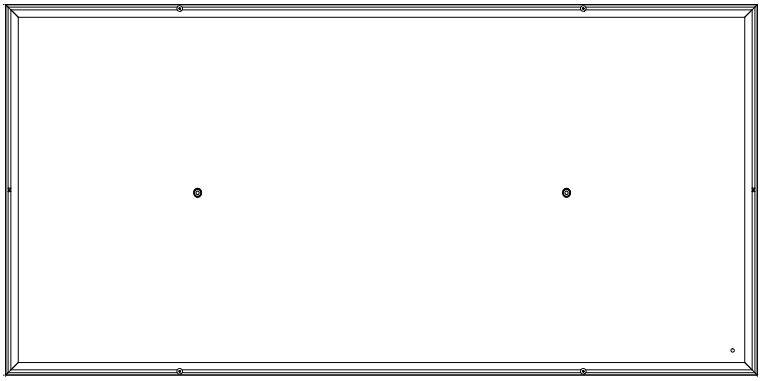




Views

FUNCTION	CLIMATELIGHT	CLIMATEPANEL	ACOUSTICLIGHT
Cooling	X	X	
Heating	X	X	
Light	X		X
Acoustics	X	X	X
Frame colour	X	X	X

SIDE VIEW, LONGITUDINAL



TOP VIEW

BOTTOM VIEW

SIDE VIEW, LATERAL

FORMAT WITHOUT FRAME

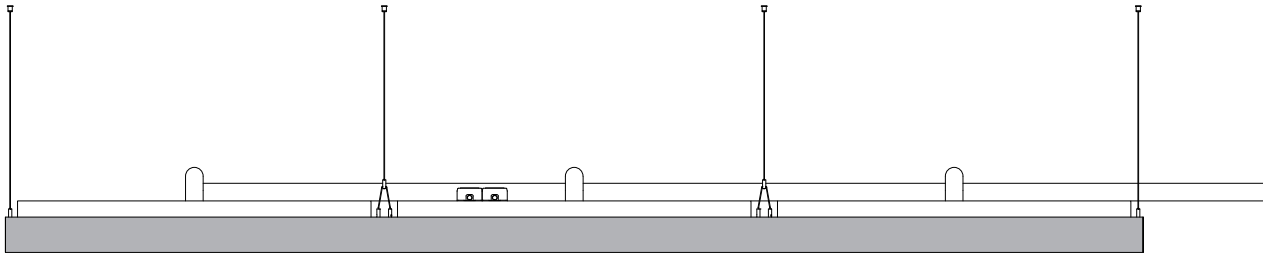
L	B	H
2159	1064	94 mm

FORMAT WITH FRAME & ACOUSTICS

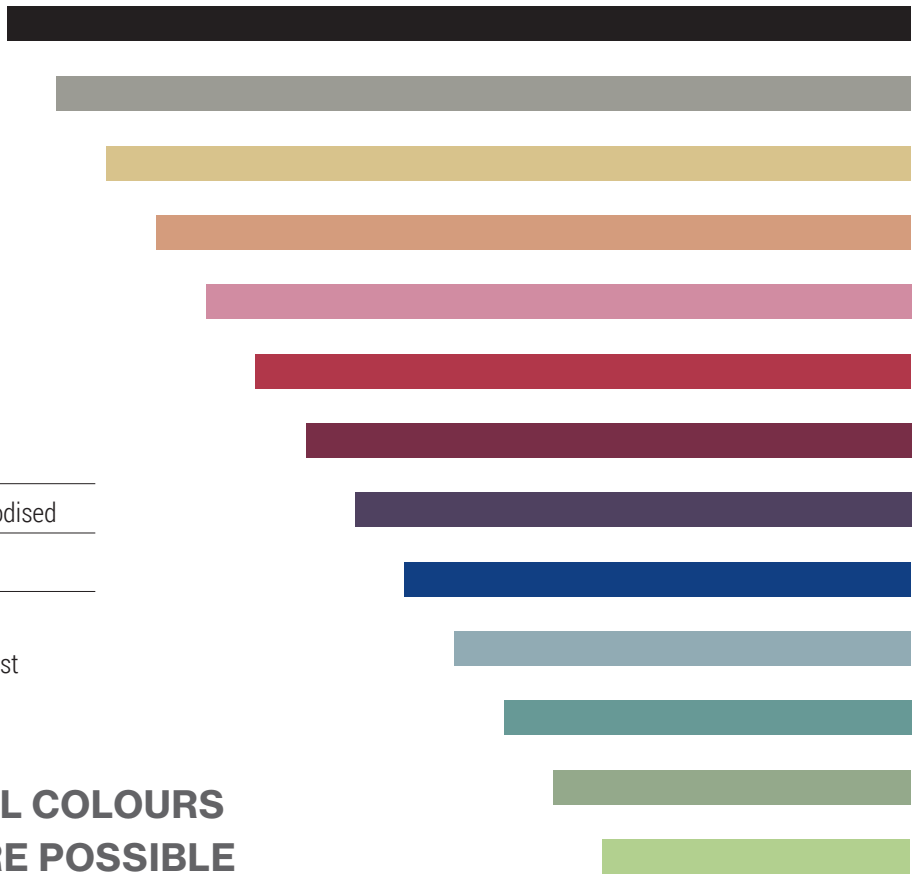
L	B	H
2163	1068	100 mm

Colours

Frame



The colour scheme of the frame allows an individual design. The coating is applied in an environmentally friendly and solvent-free manner as a durable powder coating. Thanks to the separate frame, the appearance of the elements can be modified upon request cost-efficiently.



Colour scheme	Version
Standard	Aluminium, anodised
Powder-coated	RAL
Coloured anodised & custom specifications	Upon request

ALL COLOURS ARE POSSIBLE

Control systems

Centralised or room-specific

A matching heating, cooling, and lighting control system ensures optimal operation over the entire life cycle.

The acoustically effective Climatelight, the Climatepanel, and the Acoustic Light can be combined with all popular control and regulating systems.

Offers numerous benefits for commercial spaces when combined with an AI-based KNX/DALI control system, e.g. from Loxone.

- *Operation optimised for comfort and energy savings*
- *A central TFT glass touch control panel*
- *Customisable and self-learning*
- *Local control and remote access (smartphone, Internet)*
- *Recognises presence and absence*
- *Fault info, operating time counter*
- *Day, week, and year profiles for light and climate control*
- *Expandable: Individual components can be "taught" to the system*
- *Statistical evaluation*

Temperature control

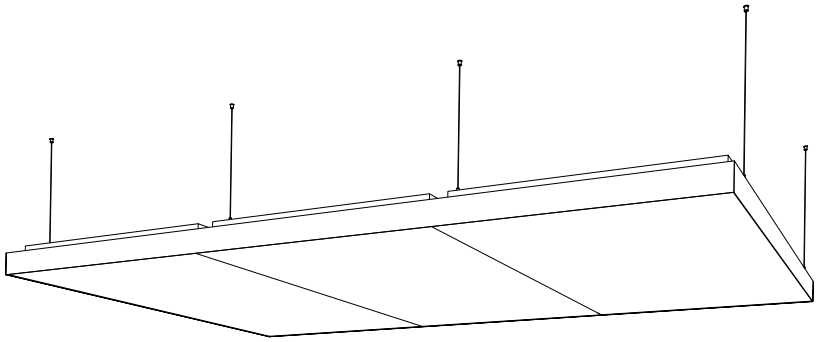
- *Controlled centrally via KNX and/or BUS systems*
- *Room-specific regulation via room thermostats*
- *Individualised*

Lighting control

- *Centrally via DALI-BUS*
- *Room-specific regulation, with or without cable*
- *Via HCL motion sensor*
- *With HCL dynamics in each case (e.g. dimming, colour regulation)*

System design

Single and group workspaces

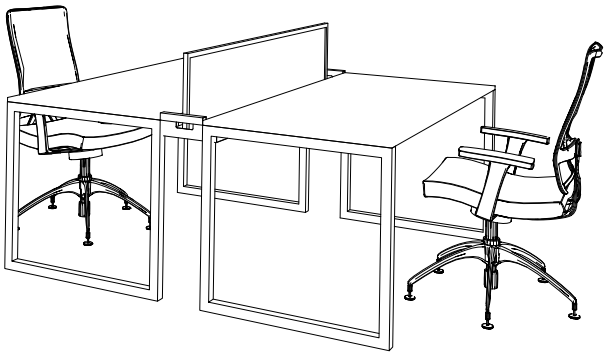


3-ELEMENT GROUP

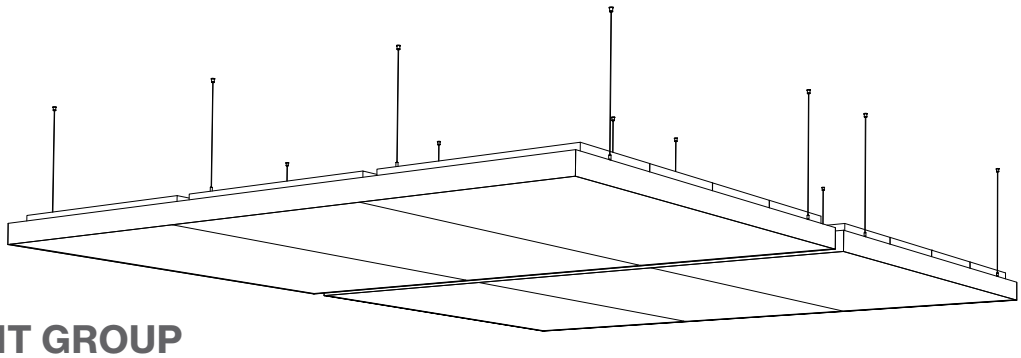
2 x Climatepanel
1 x Climatelight

Based on the requirements, the ceiling sails are hung above the working spaces. These ceiling sails can handle the entire absolute cooling load and heating load, as well as provide workspace-compliant HCL lighting.

A 3-element combination consisting of Climatepanels and a Climatelight is optimally suited for single offices and groups, as well as for the zonal cooling of open areas.



For open-plan offices, conference rooms, and room-in-room solutions

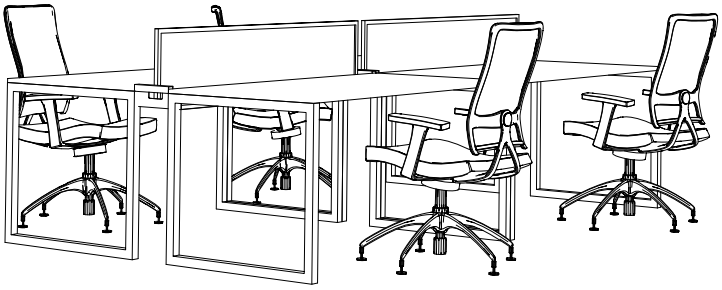


2 X 3-ELEMENT GROUP

2 x Climatelight

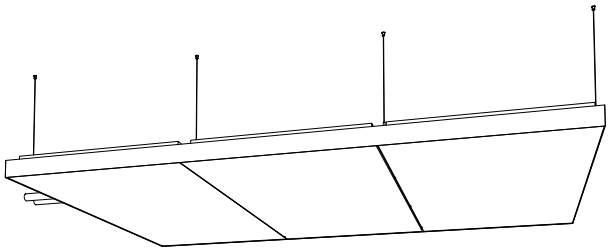
4 x Climatepanel

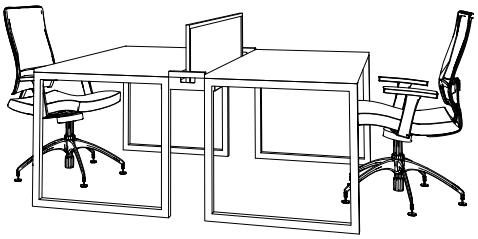
A multiple 3-element combination is suited to the zonal heating, cooling, and planar illumination of areas of all sizes.

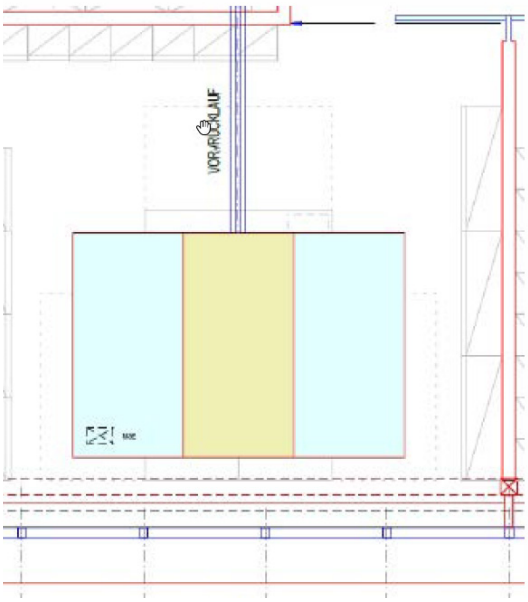


Room example

Architectural office







DATA

No. of persons	3 computer workstations
Area	25m²
Orientation	South/east, with sun protection
Acoustics	6.9 m² absorption surface
Lighting	Planar >500 lx with 3 000 K to 6 500 K
Ventilation	natural window ventilation
Dew point	Not regulated

Indoor temperature:	<26°C (up to >38°C outdoor temp.)
Control & regulation	TFT touch control panel, KNX & DALI
Heating	interpanel only (infrared)
Cooling	interpanel only (infrared)
Cold/heat generation	air-to-water heat pump
System-Intelligence	temperature, weather forecast, AI-based optimisation

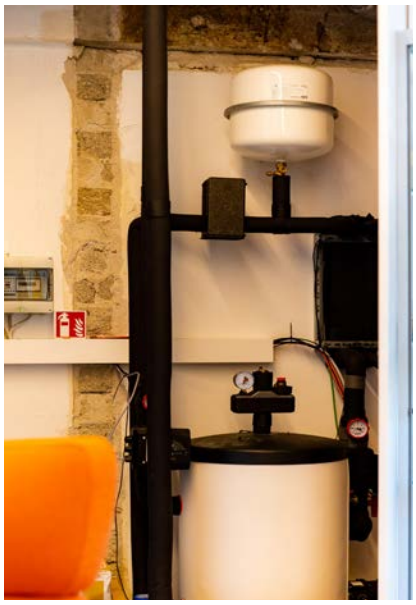
COMPONENTS FOR HCL LIGHTING

Control unit/BUS	KNX-DALI Miniserver
Room control element	TFT touch panel
Functions	Presence, programs and automatic operation, time
Workspace lighting	interpanel Climatelight with 3 000 – 6 500 K, DALI

Energy requirements

Operating costs, cooling, and HCL lighting

OPERATING COSTS FOR COOLING



For the 25 m² office, a cooling capacity of approx. 750 W is installed. The system technology utilises direct evaporation via plate heat exchangers and connected buffer tanks.

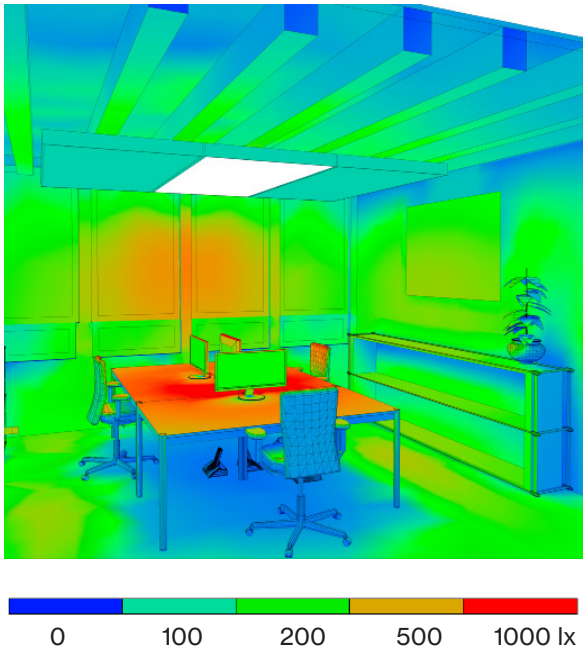
Inlet temperatures and the operating efficiency of the heat pump are continuously monitored and optimised by an AI system. For the inlet temperature in the event of peak load, a temperature of 8°C was agreed upon with the client.

With a calculated System COP of 3 and a running time of 12 h per day, the energy costs for cooling can be approximated at €0.60/day and office or €0.024/m²*full load day.

OPERATING COSTS – SUMMER 2019

In the hottest month of the record summer of 2019, where several days experienced an outdoor temperature > 40°C, 250 m² of climate-controlled space resulted in energy costs of approx. €80 or 0.32 €/m² (approx. 1 kWh/m²).

PLANNING AND OPERATING COSTS OF LIGHTING



For three workspaces, a Climatelight was budgeted. According to photometric calculations, approx. 110 W can be used to ensure an illumination level of > 500 lx. Optionally, with 220 W >1 000 lx can be achieved.

Hence, for an average illumination duration of 1 750 h and at €0.30/kWh, each workspace incurs operating costs of approx. €19.25/employee and year for the HCL illumination.

Temperature and comfort

Planning and reality in comparison

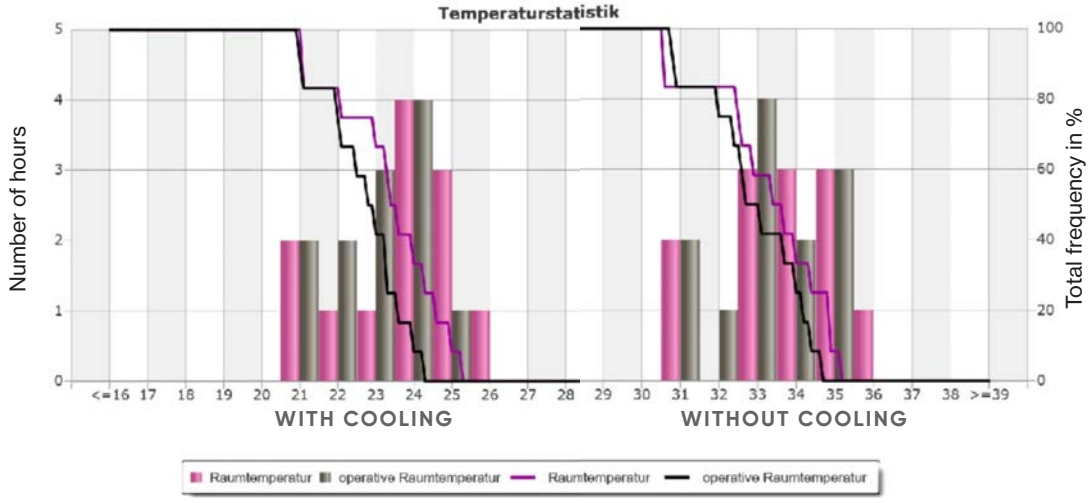
COOLING

With cooling, the specified standard reference scenario for a location in Düsseldorf ensures indoor temperatures of less than 26°C.

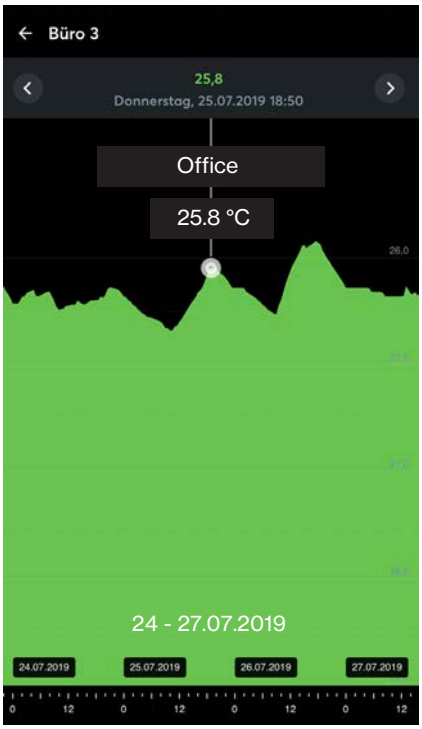
Without cooling, temperatures significantly exceed this value. Temperatures are significantly over 33°C in the long term.

THERMAL SIMULATION ACCORDING TO VDI 2078

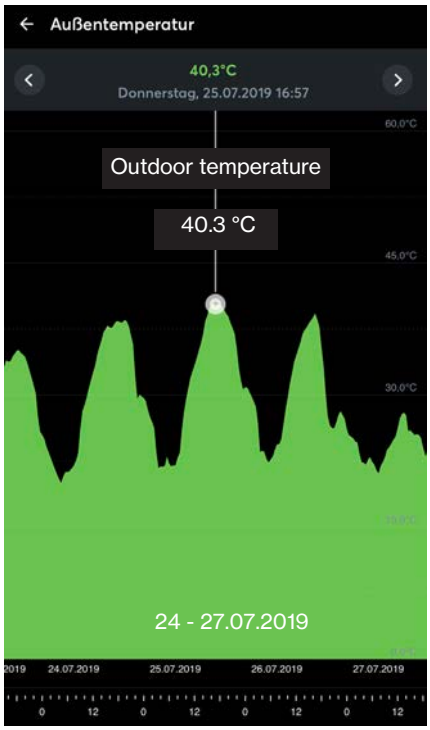
Temperature statistic month of July



MEASURED VALUES – OFFICE TEMPERATURES IN SUMMER 2019



OFFICE TEMPERATURE



OUTDOOR TEMPERATURE

Despite the record summer in 2019 with external temperatures exceeding 40°C in the shade, the offices have a comfortable indoor climate.

With such high external temperatures, the spaces were already felt by some to be "too cold" at an indoor temperature of 26°C.

However, the available cooling capacity had not been exhausted.

Project:

Glöckler & Lauer GmbH & Co. Systemhaus

Indoor climate retrofit in utilized existing building using **interpanel® Climatelight and Climatepanel**. The office spaces are ventilated exclusively via the windows. To supply heat and cooling a highly efficient air-to-water heat pump combined with a KNX AI system control unit with DALI is used.

Functions and innovation

Dew and condensation-free radiant cooling

Integrated circadian HCL workspace lighting

Multifunctional and modular

The worlds coldest ceiling

Radiant cooling without dew-point issues

PATENTED MULTIPLE TIMES WORLD-WIDE, ONLY FROM INTERPANEL

interpanel is the exclusive licensee of the Fraunhofer Instutute

Condensation-free radiant cooling

The passive, absolutely silent, maintenance and draft-free cooling without dew-point issues

Is a chilled ceiling comfortable?

Functional principle and comfort

With conventional panel cooling systems, the humid ambient air comes into direct contact with the cooled surface. At these cooled surfaces, the moisture in the air condenses out due to the laws of physics.

Due to this effect and the warm, humid climate in summer, the performance of conventional panel cooling systems is significantly reduced. Particularly in combination with natural ventilation, conventional panel cooling does not work on over 40 working days each year.

Because it was physically impossible to avoid the temperature falling below the dew point in the past, this led to the formation of condensed water and structural damage. Alternatively, dew point sensors are activated, which shut down the system. However, this means that there is no longer any cooling taking place, resulting in an increased number of users complaining of an overly warm indoor climate and growing concentration-related problems.

With interpanel technology, which has been patented worldwide by the Fraunhofer Institute for Building Physics, the humid ambient air no longer comes into contact with the chilled surface, and the exchange of thermal energy is maintained.

This structure prevents the formation of condensed water and increases the cooling performance severalfold. This effect is particularly noticeable in warm summer climates.

With this system, the temperature of the cold water is no longer 16–18°C, but up to 6°C. For the very first time, this fully maximises the pleasant temperature difference of up to 14 K between the ceiling and the indoor temperature. In practice, inlet temperatures of 10–12°C have proven optimal during peak load scenarios.

This allows the interpanel® Climatelight and Climatepanel to be optimally combined with natural ventilation, e.g. when refurbishing existing buildings.

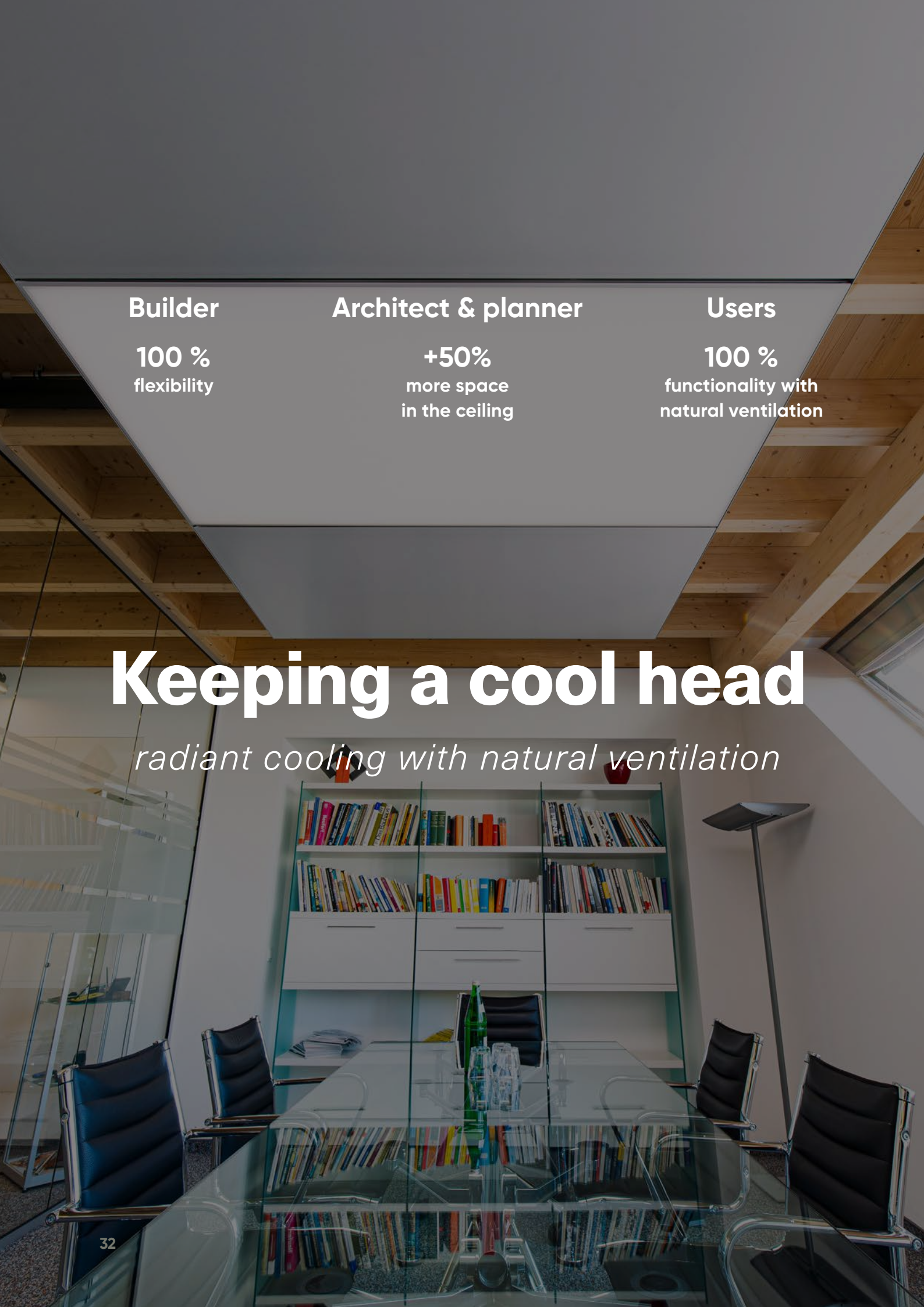
Category	Dissatisfied (%)	Radiant temperature asymmetry [K]			
		Warm ceiling	Cold wall	Cold ceiling	Warm wall
A	< 5	< 5	< 10	< 14	< 23
B	< 5	< 5	< 10	< 14	< 23
C	< 10	< 7	< 13	< 18	< 35

PERMISSIBLE RADIATION TEMPERATURE ASYMMETRY ISO 7730

INFORMATION

For example, according to international standards, an average ceiling temperature of 12°C at a room temperature of 26°C is felt to be extremely comfortable. A cool room ceiling is already perceived to be highly comfortable due to evolutionary factors. The flow of heat takes place (e.g. in outdoor settings) from the head and body to the cool day or night sky.

"WARM FEET"
"COOL HEAD"



Builder	Architect & planner	Users
100 % flexibility	**+50%** more space in the ceiling	**100 %** functionality with natural ventilation

Keeping a cool head

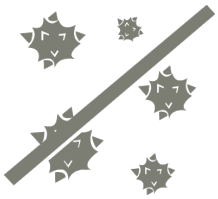
radiant cooling with natural ventilation

Advantages

Unique high-performance cooling & heating

DRAFT-FREE

Illnesses due to cold air and drafts are a daily reality in countless office spaces. The acoustically effective Climatelight from interpanel is absolutely silent and without drafts even when operating at maximum cooling capacity.



GERM-FREE

Air as a cooling medium is often the carrier of germs, dust, and pollen. We utilise a cooling system that does not whirl up germs or distribute dust, and is maintenance-free.

CONDENSATION-FREE

Constant, high-performance panel cooling with many times the cooling capacity in comparison to all conventional systems. With the separating layer which allows heat energy to pass through, condensation is permanently and reliably avoided.

"In summer, the rooms are now cooled cost-effectively without the negative effects of a conventional air-conditioning system, and in winter the panels even provide heating. A truly magnificent product!"

Oliver Driemel, CEO at Schnittmeister GmbH & Co. KG, Berlin

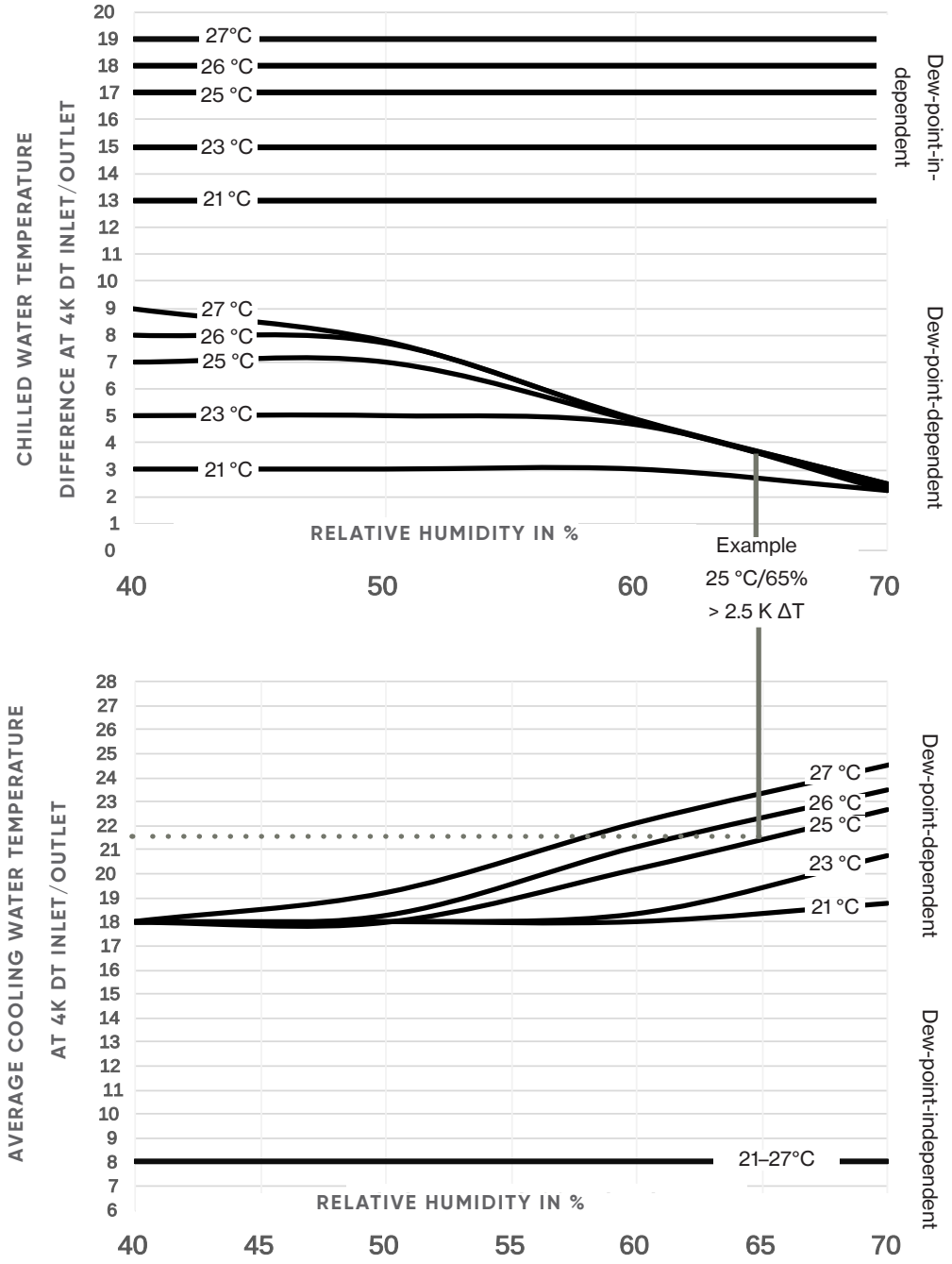
SILENT AND DRAFT-FREE HIHG COOLING CAPACITY EXCEEDING >136 W/M²

Cooling capacity

Influence of room temperature and air humidity

The table illustrates how greatly achievable real-world cooling performance depends on the desired ambient temperature as well as the ambient humidity. The characteristic values show that the dew-point cut-off has a significant influence on the achievable real-world cooling performance.

Hence, if a system does not feature a dew-point-independent design, this may – particularly during peak loads and in combination with natural ventilation – lead to a complete loss of or significantly reduced cooling capacity for several months in summer if a dew-point-dependent system is being used.



Boundary conditions

Minimum inlet temperature for dew-point-dependent panel cooling system:	16 °C
Difference between inlet and return flow:	4 K
Safety margin for dew point temperature:	1.5 K

Cooling performance with natural ventilation

Standard test values and achievable real-world cooling capacity can differ greatly during actual operation due to the dependency between the dew point temperature of the ambient air and cooling water temperature.

The following calculations provide a guide for the achievable performance with conventional panel cooling systems and designs in comparison to a dew-point-independent variant.

SAMPLE CALCULATION

Desired room temperature:	25°C (up to 38°C outdoor temp.)
Ventilation:	window ventilation
Reference climate:	Düsseldorf
	27/7/19, 08:00 am 4:00 pm
Outdoor climate in summer:	26°C, 65 % rel. H.

DEW-POINT-DEPENDENT

Cooling capacity (dew-point-dependent):	70 W/m² at 10 K ΔT
Simplifying assumption:	7 W/m²*K
Minimum inlet temp.:	16°C
Resulting dew point temp.:	19°C
ΔT to dew point temp.:	1.5 K
Minimum inlet temp.:	20.5°C
Difference btw. inlet and return:	4 K
Average cooling water temp.:	22.5°C

MARGIN WITH ROOM TEMPERATURE (EFFECTIVE ΔT)

= desired room temp. – average cooling water temp.:

25°C –22.5°C = **2.5 K ΔT**

Available cooling capacity: 2.5 K * 7 W/m²*K =

17.5 W/m²

SUMMARY: DEW-POINT-DEPENDENT SYSTEM

The resulting cooling capacity is to be calculated for the summer scenario in combination with natural ventilation with an average cooling water temperature of 22.5°C.

The capacity of the cooling ceiling or panel cooling is therefore reduced by 75 %. Generally, the cooling ceiling is completely switched off for several hours by the dew point sensor to prevent condesation.

DEW-POINT-INDEPENDENT

Cooling capacity interpanel:	100 W/m² at 16 K ΔT
Planned inlet temp.:	8°C
Resulting dew point temp.:	19°C
ΔT to dew point temp.:	/
Inlet temp.:	8°C
Difference btw. inlet and return:	4 K
Average cooling water temp.:	10°C

MARGIN WITH ROOM TEMPERATURE (EFFECTIVE ΔT)

= desired room temp. – average cooling water temp.:

25°C – 10°C = **15 K ΔT**

Available cooling capacity at 15K ΔT =

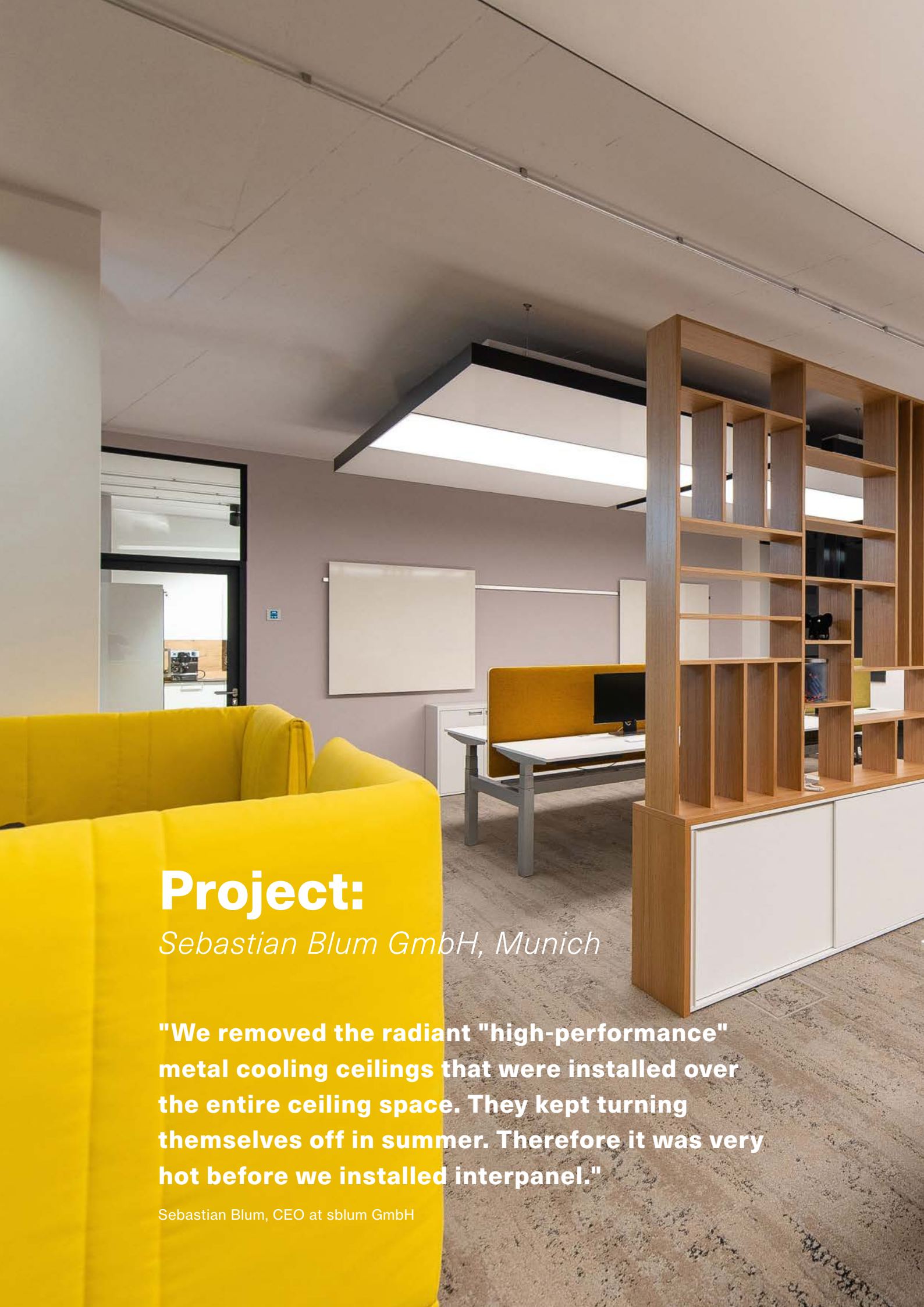
100 W/m²

SUMMARY: DEW-POINT-INDEPENDENT SYSTEM

The resulting cooling capacity can be fully utilised. The performance of interpanel® corresponds to the test capacity.

The ceiling coverage can, main-taining the same cooling capacity, be reduced to approx. 25 % compared to an optimally controlled dew-point-dependent high-performance system.

Due to the higher dT of 15 K, night time cooling can be used. Therefore the size of the chiller is reduced by 35 to 75 % while using the thermal mass of the building.



Project:

Sebastian Blum GmbH, Munich

"We removed the radiant "high-performance" metal cooling ceilings that were installed over the entire ceiling space. They kept turning themselves off in summer. Therefore it was very hot before we installed interpanel."

Sebastian Blum, CEO at sblum GmbH

Integrated circadian workspace light

Biodynamic, glare-free, and bright

Bio-adaptive lighting

Human Centric Lighting

HCL allows for a lighting colour of 3 000–6 500 K that is adaptive, biodynamic, and independent of the time of day. The brightness of the interpanel® Climatelight can be adjusted steplessly. At workplaces, this can have a demonstrably positive effect on the productivity and health of employees.

OPTIMAL FOR

- ***Productivity and light-optimised office workspaces***
- ***Work tables arranged singly or in rows***
- ***Flexibly designed office spaces***
- ***Open plan offices***
- ***Co-working spaces***
- ***Nursing homes and healthcare settings***
- ***Representative showroom areas***
- ***Production areas***

CHARACTERISTICS

- ***Light output that simulates daylight with 15 000 lm per colour channel***
- ***3 000 K–6 500 K steplessly adjustable***
- ***Dimmable and flicker-free***
- ***DALI, EnOcean, touch, app, switch***
- ***Up to 1 000 lx of glare-free workspace lighting***
- ***Extremely even illumination of luminaire surface for a premium look***
- ***Easy to control, both manual and automatic***

HUMAN CENTRIC LIGHTING

With HCL, living and working spaces are brought in line with biological circadian rhythms. Colour temperature and intensity are adapted to requirements in an entirely new fashion. Because light has an emotional, biological, and visual effect on humans. Depending on the scenario, each Climatelight from interpanel can be adapted to the individual lighting-specific and physiological requirements of users.

Furthermore, the uniquely large illumination surface of the Climatelight also has a positive biological effect thanks to the large viewing angle. The high possible illumination intensities which greatly exceed 1 000 lx can create a stimulating lighting ambience over defined periods of time. Following natural circadian rhythms, the interpanel Climatelight reduces the proportion of blue wavelengths in the light, e.g. in the afternoon. In addition, the lighting intensity is adapted to the time of day and illumination situation. Optionally, this can also be performed by an intelligent control unit with sensor technology.

Naturally, users may intervene at any time, and defined profiles can be selected and easily adjusted as required.

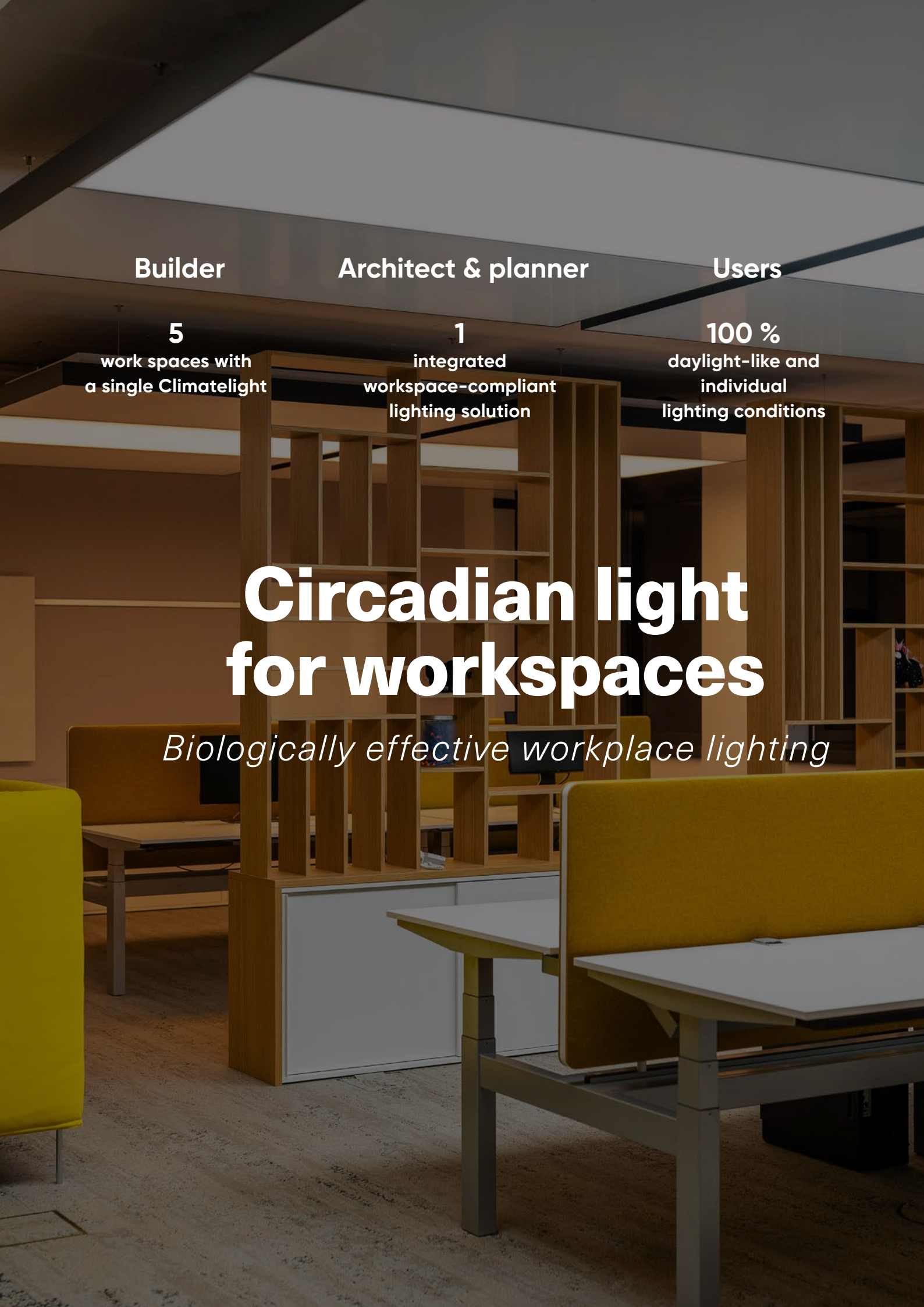
For a favourable biological effect, HCL light should be designed to utilise large surfaces and to reach the eye from the front as well as above. Light with a high proportion of blue wavelengths and higher intensities has a stimulating effect. In order to have an effect, 1 000 lx on the work surface is the goal.

One often neglected factor is that of the increase in corneal opacity with age. Hence, the biological impact depends directly on the age of a person. Due to the increase in corneal opacity with age, e.g. a 60-year-old person requires approximately double the brightness as compared to someone who is 25 years old in order to achieve the same effect.

The interpanel® Climatelight achieves an optimal biological effect thanks to the large illumination surface and the adjustable, high illumination intensity.

MORE INFORMATION:

www.interpanel.com



Builder

5
work spaces with
a single Climatelight

Architect & planner

1
integrated
workspace-compliant
lighting solution

Users

100 %
daylight-like and
individual
lighting conditions

Circadian light for workspaces

Biologically effective workplace lighting

Advantages

Daylight quality illumniation for productive workspaces

FULL-SURFACE

A unique indoor ambience is created thanks to the even, diffuse, and-high-performance light.

In addition, the large illumination surface has a positive effect on the circadian rhythms of humans.

GLARE-FREE

Even workspaces which need to satisfy the highest requirements are illuminated evenly and glare-free according to internationael standards.

DAYLIGHT-ADAPTIVE

For a pleasant atmosphere and better performance each day, the lighting colour precisely adapts to biological rhythms down to the last Kelvin.

Lighting planning

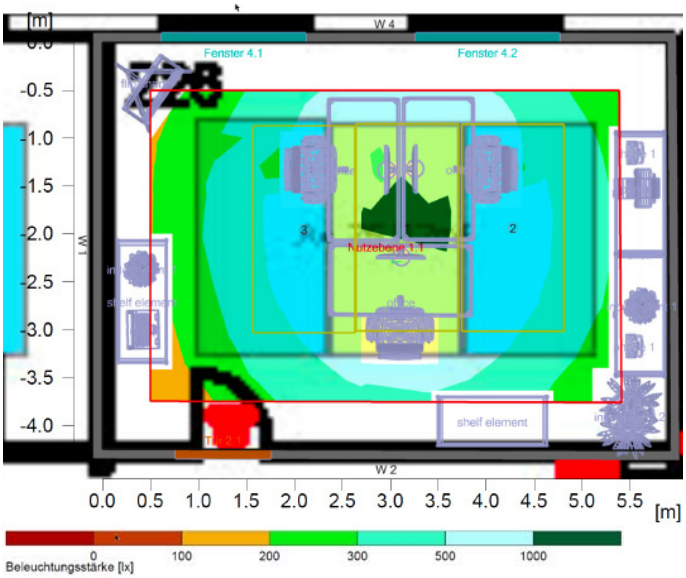
Example: single office

SINGLE OFFICE

Working space with HCL illumination

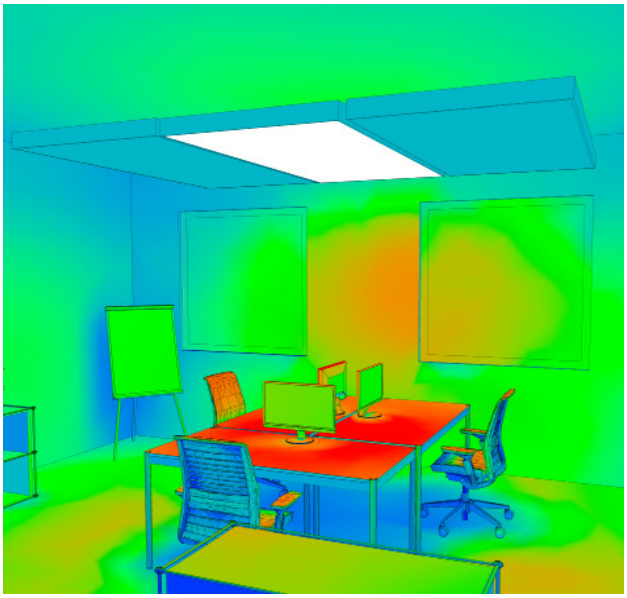
The system structure comprises 3 interpanel modules. Two are acoustically effective Climatepanels, the central one provides workspace-compliant HCL illumination, and as an acoustically effective Climatelight, simultaneously also provides illumination in the room.

Equipped with presence and movement sensors utilising IR and HF technology as well as a brightness/daylight comparison feature, central or individual adjustment takes place to also ensure optimal energy efficiency and operational management.



AN INTERPANEL ELEMENT OPTIMALLY PROVIDES UP TO FOUR WORK SPACES WITH UP TO 750 LX.

Height of lighting level: 2.7 m



Lighting level in lx

Example: open-plan office

OPEN-PLAN OFFICE GROUP WORKING SCENARIOS

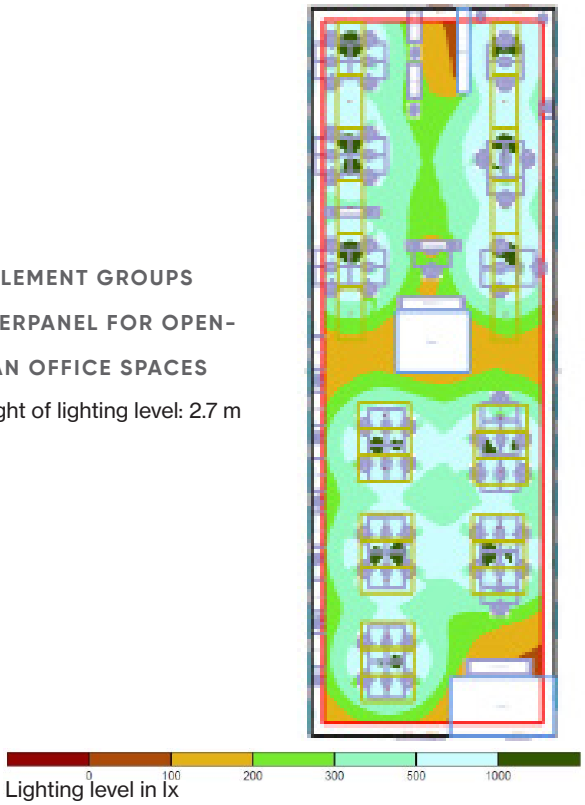
Open-plan office space with flexibly adjustable work spaces/furniture arrangements. Individual control of lights via DALI, EnOcean, Bluetooth.

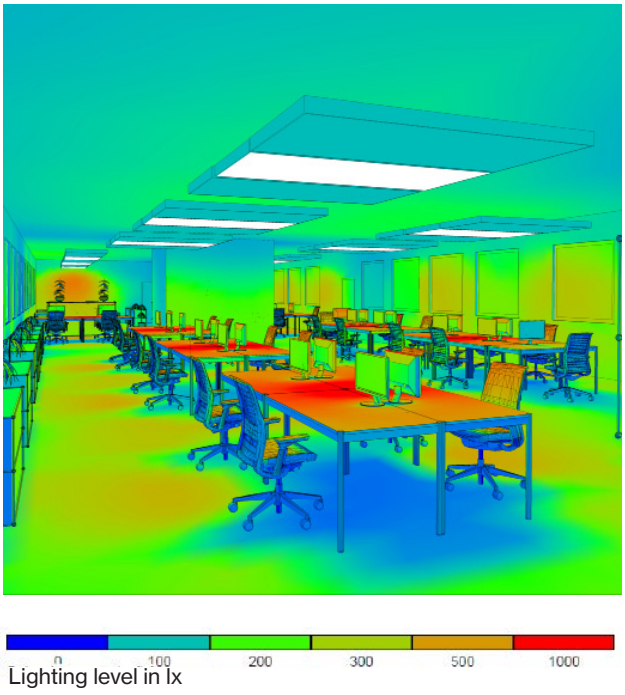
Depending on the usage, the extensive illumination not only provides balanced, daylight-like light, but can also be adjusted zonally as required with regard to lighting temperature and brightness.

In this case, thanks to the combination of a lighting surface with panel cooling, this simultaneously implements an effective workspace cooling and heating solution as well as improves the acoustics.

3-ELEMENT GROUPS INTERPANEL FOR OPEN-PLAN OFFICE SPACES

Height of lighting level: 2.7 m





Multi-functional and modular

Swiftly and safely planned, installed, and ready to use

Multifunctional and modular

Quickly planned, installed, and ready to use

The full prefabrication of the multi-functional ceiling sails allows for an almost dust-free installation and swift implementation.

- *No drying times*
- *Minimal interfaces*
- *Practically no modifications to building structure*
- *Hidden cables*
- *Minimal construction times*
- *Relocatable*
- *Minimal invasive*
- *Extremely simple installation, even in existing occupied buildings*

LESS INTERFACES

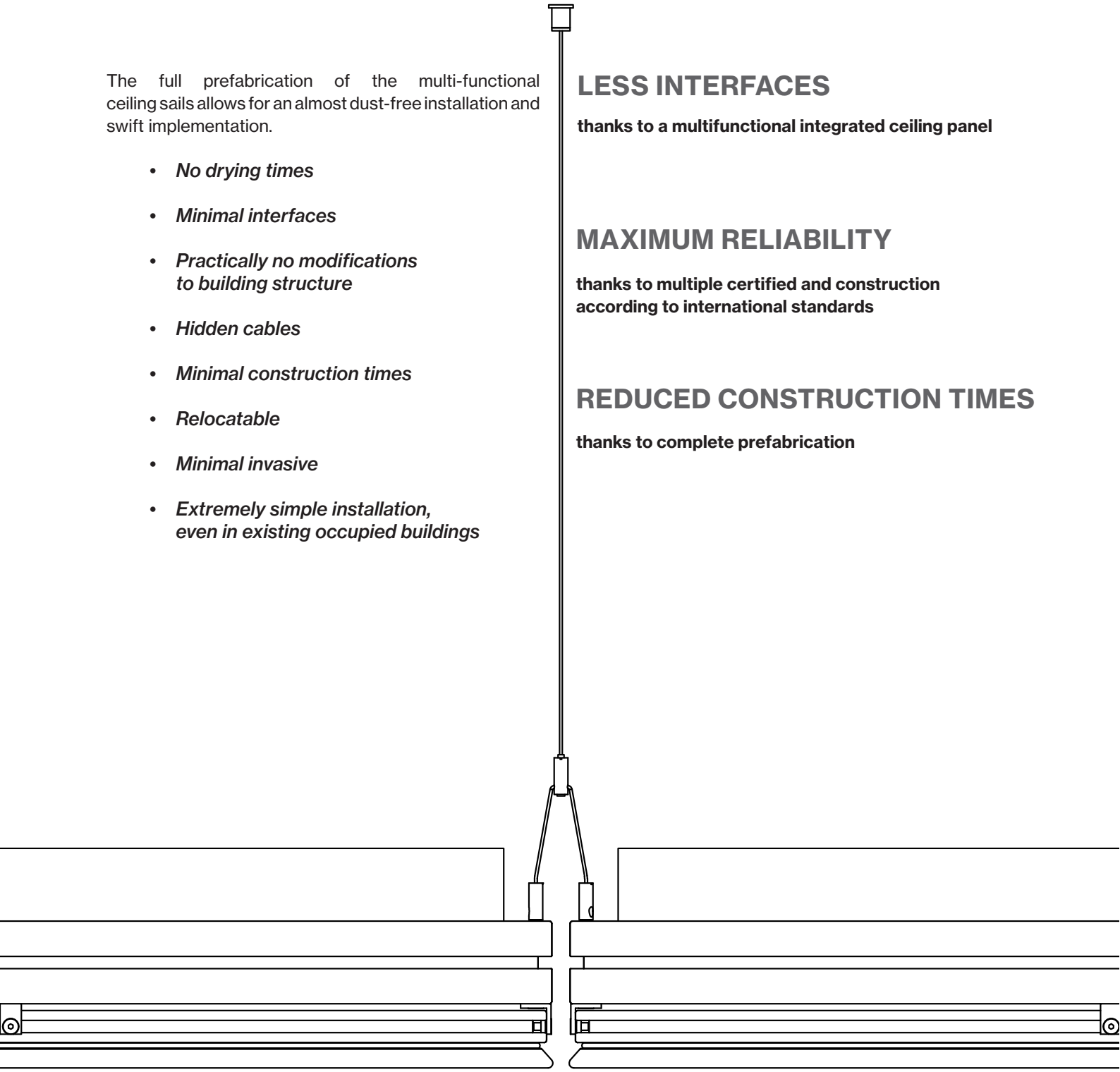
thanks to a multifunctional integrated ceiling panel

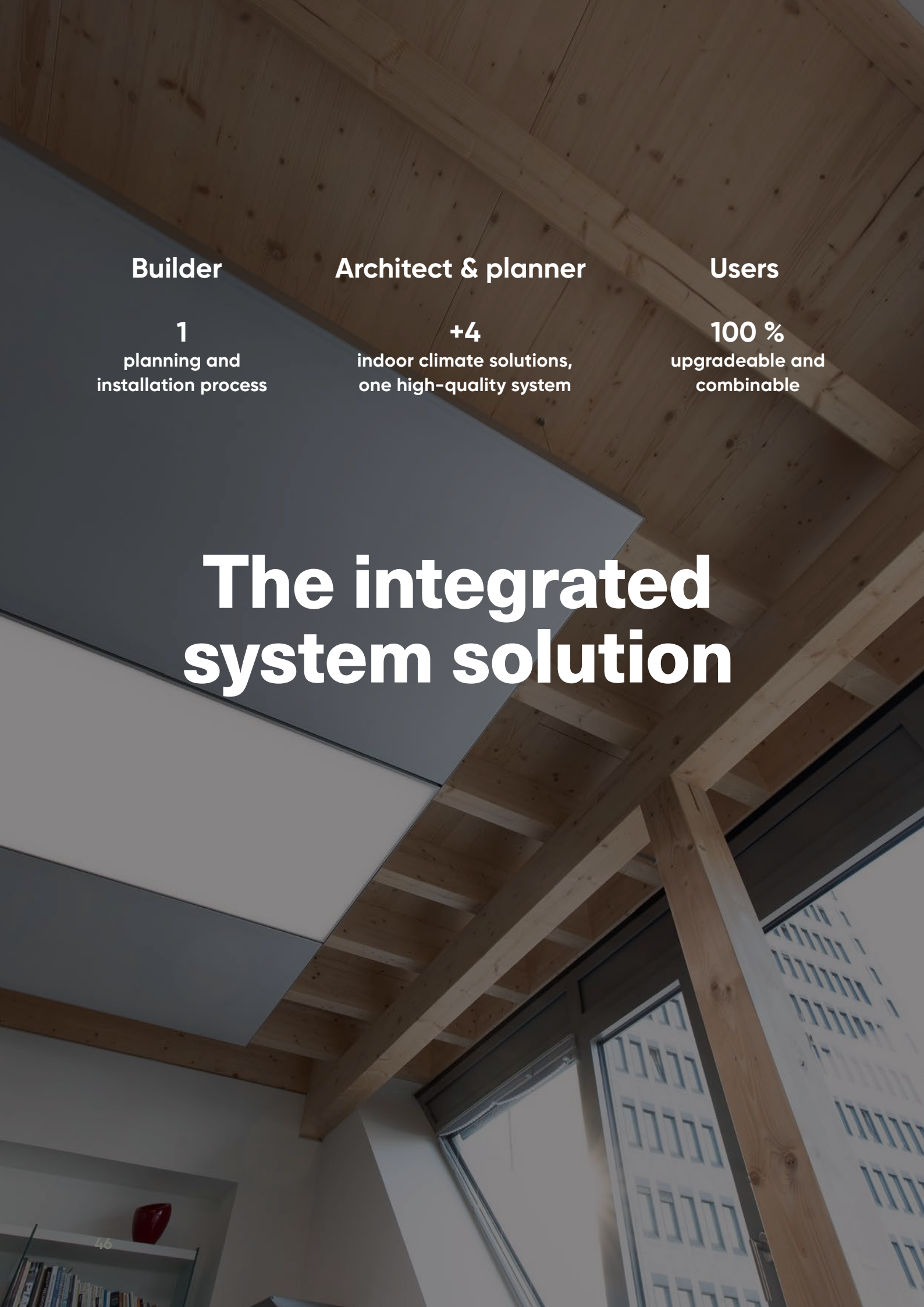
MAXIMUM RELIABILITY

thanks to multiple certified and construction according to international standards

REDUCED CONSTRUCTION TIMES

thanks to complete prefabrication





Builder

1
planning and
installation process

Architect & planner

+4
indoor climate solutions,
one high-quality system

Users

100 %
upgradeable and
combinable

The integrated system solution

Multi-functionality redefined

Four indoor climate solutions in one system

The actual costs incurred in a construction process frequently do not stem from the directly attributable investment costs of a system.

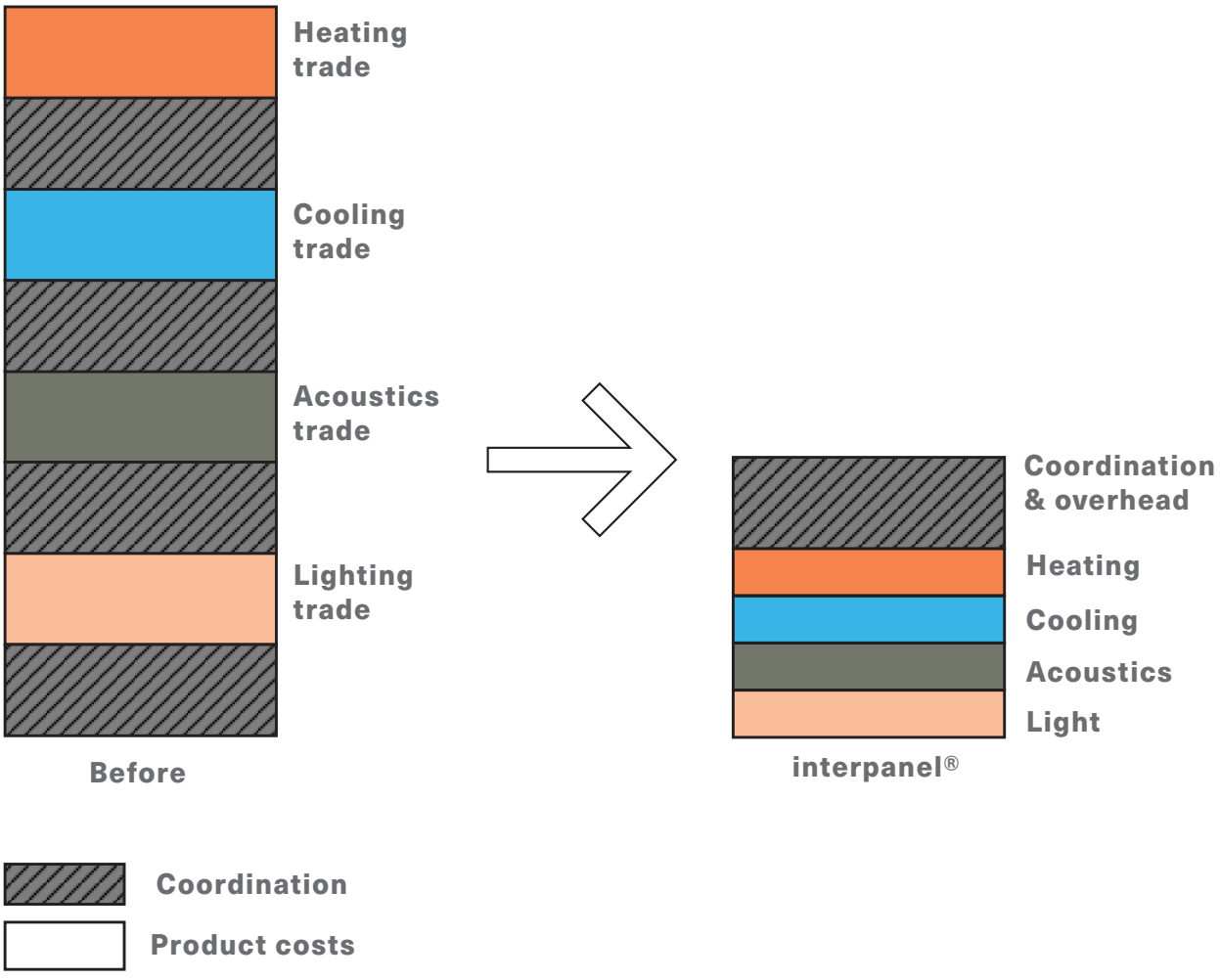
In the planning and construction process, there are significant cost factors which contribute to the construction costs:

Planning coordination, interface coordination, dimensioning of individual solutions, coordinating various craftsmen, material coordination, specialist planning of the individual trades and comparison of the different products, cost comparisons, reviewing quotes, reassessment, etc.

By choosing interpanel, this cost- and time-intensive coord nation of various trades and solutions, long installation and drying times, as well as obscure processing workflows and interfacing issues in the construction process are avoided.

With the high degree of prefabrication, all that is required are coordination, installation, and commissioning.

The rapid process from planning to commissioning also allows for the refurbishment of currently occupied buildings.



Saving on planning and time costs of coordination, tenders, and implementation via a premium multi-functional system solution.

Project:

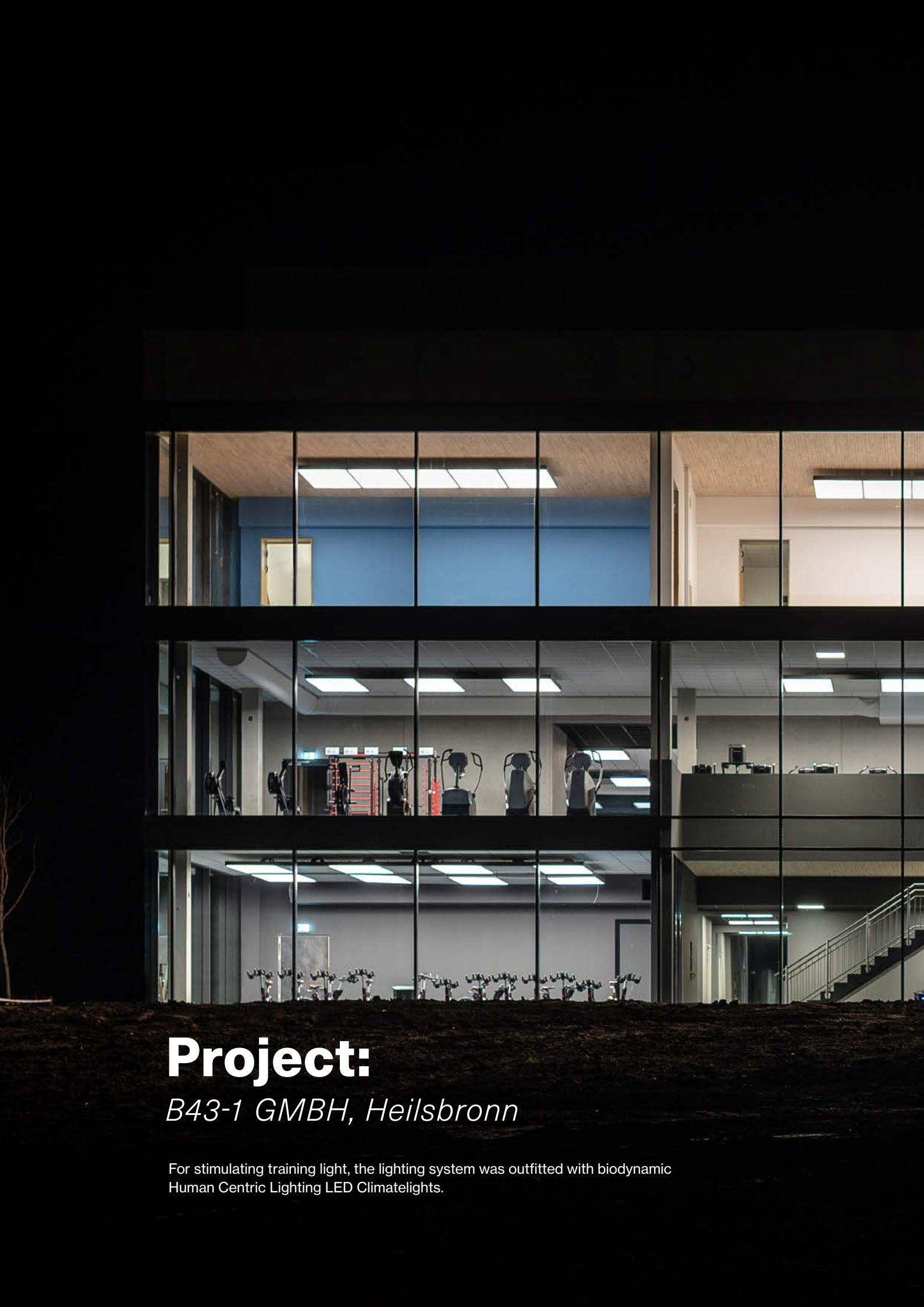
WAHL GRUPPE, Reutlingen

Lighting and cooling can be operated independently.

Project:

WAHL GRUPPE, Reutlingen

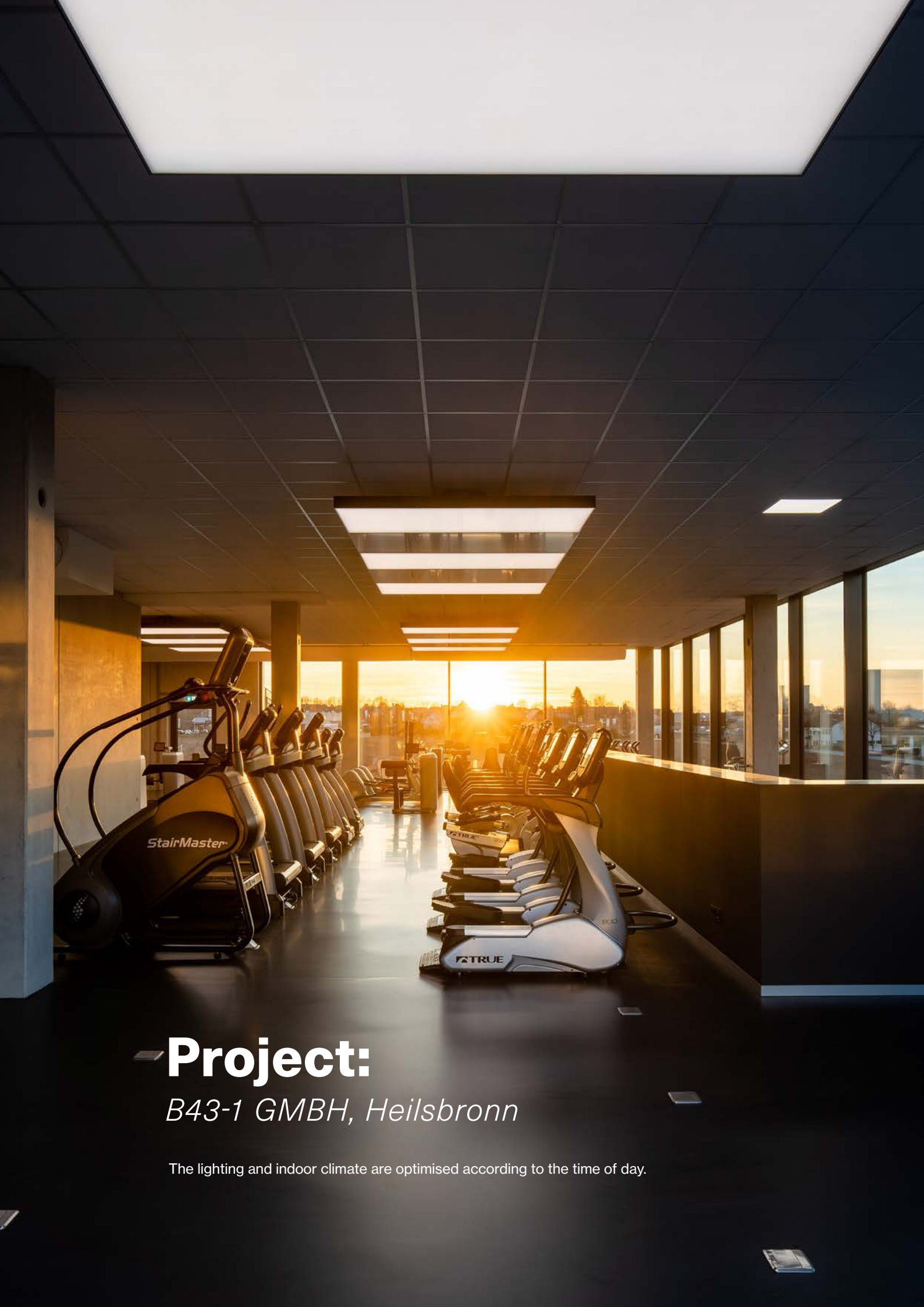
Cooling, heating, acoustics, and light. Lighting intensity of up to 4 500 lx.



Project:

B43-1 GMBH, Heilsbronn

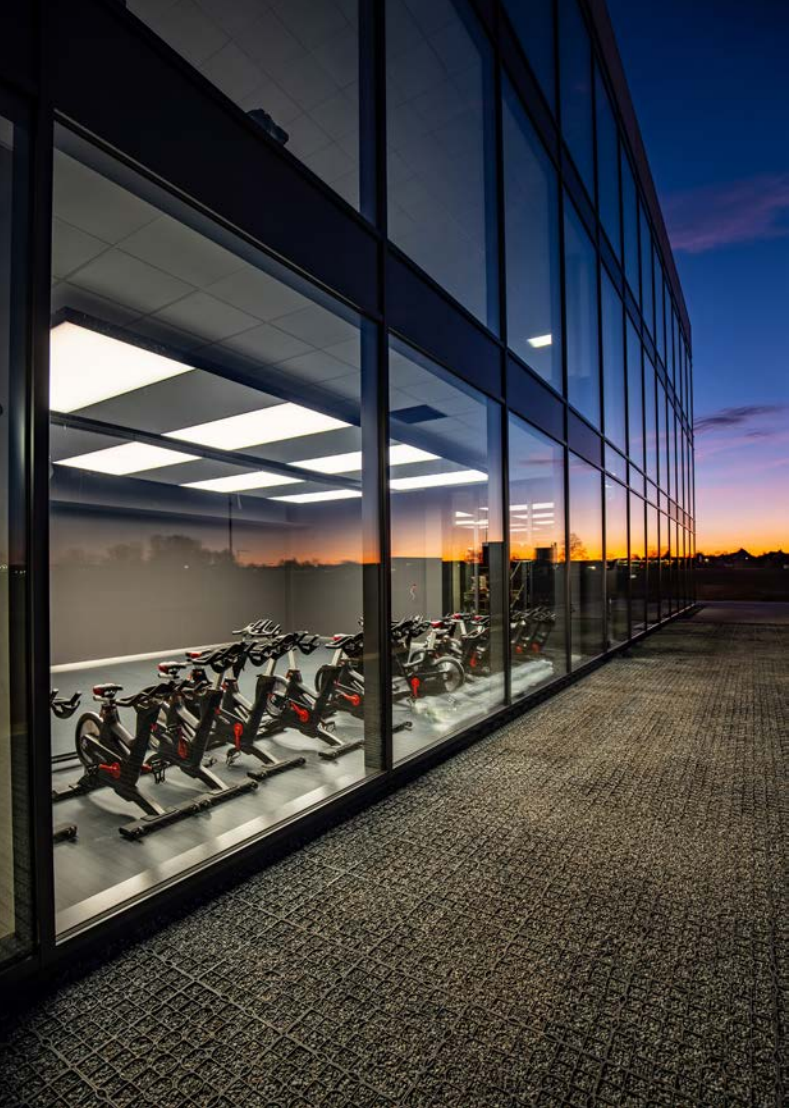
For stimulating training light, the lighting system was outfitted with biodynamic Human Centric Lighting LED Climatelights.

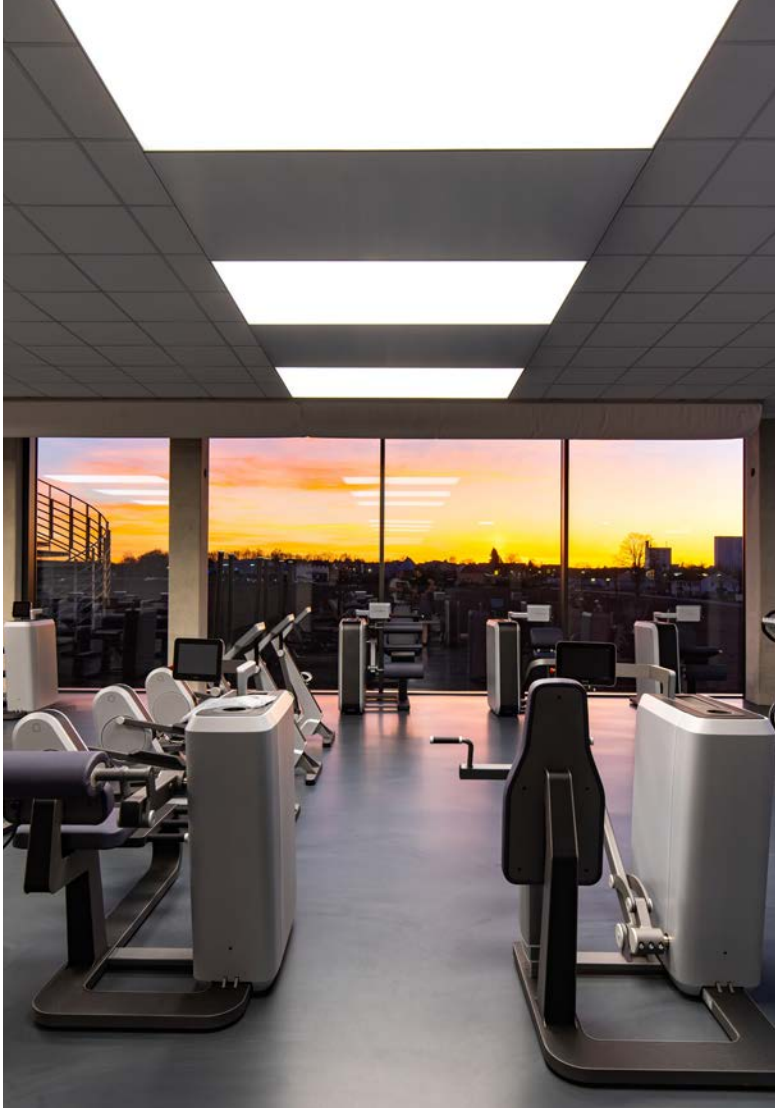


Project:

B43-1 GMBH, Heilsbronn

The lighting and indoor climate are optimised according to the time of day.



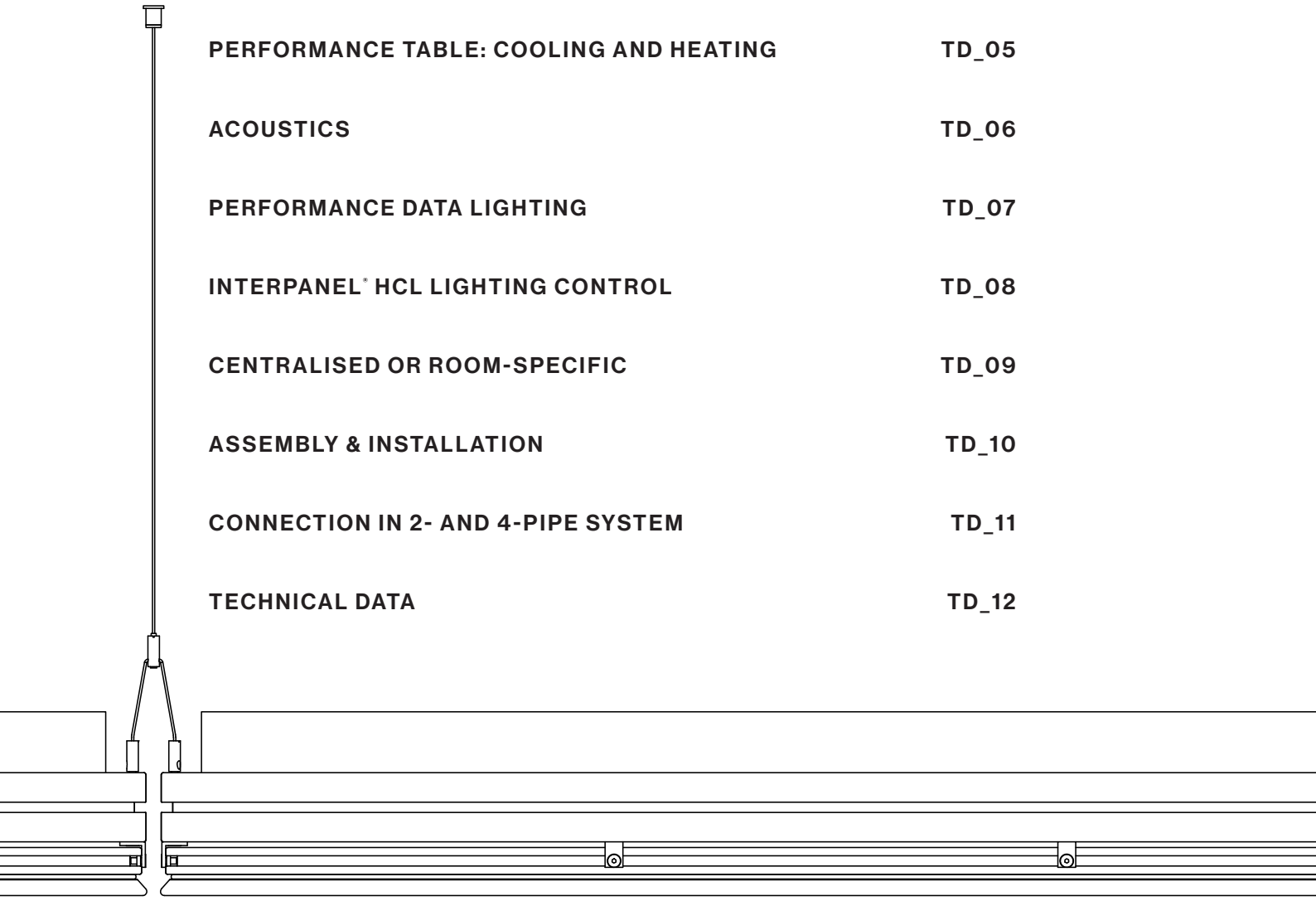


Climatelight

Climatepanel

Acousticlight

Technical data

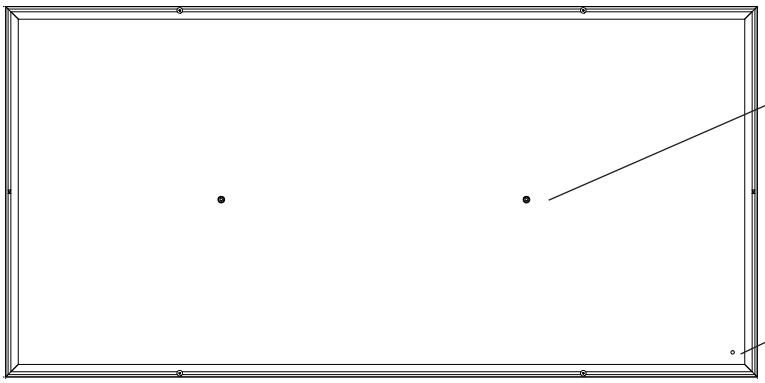


TECHNICAL DATA

VIEWS

TYPE: INTERPANEL® CLIMATEPANEL, CLIMATELIGHT, AND ACOUSTICLIGHT

SIDE VIEW, LONGITUDINAL



TOP VIEW

BOTTOM VIEW

SIDE VIEW, LATERAL

FORMAT WITHOUT BEZEL

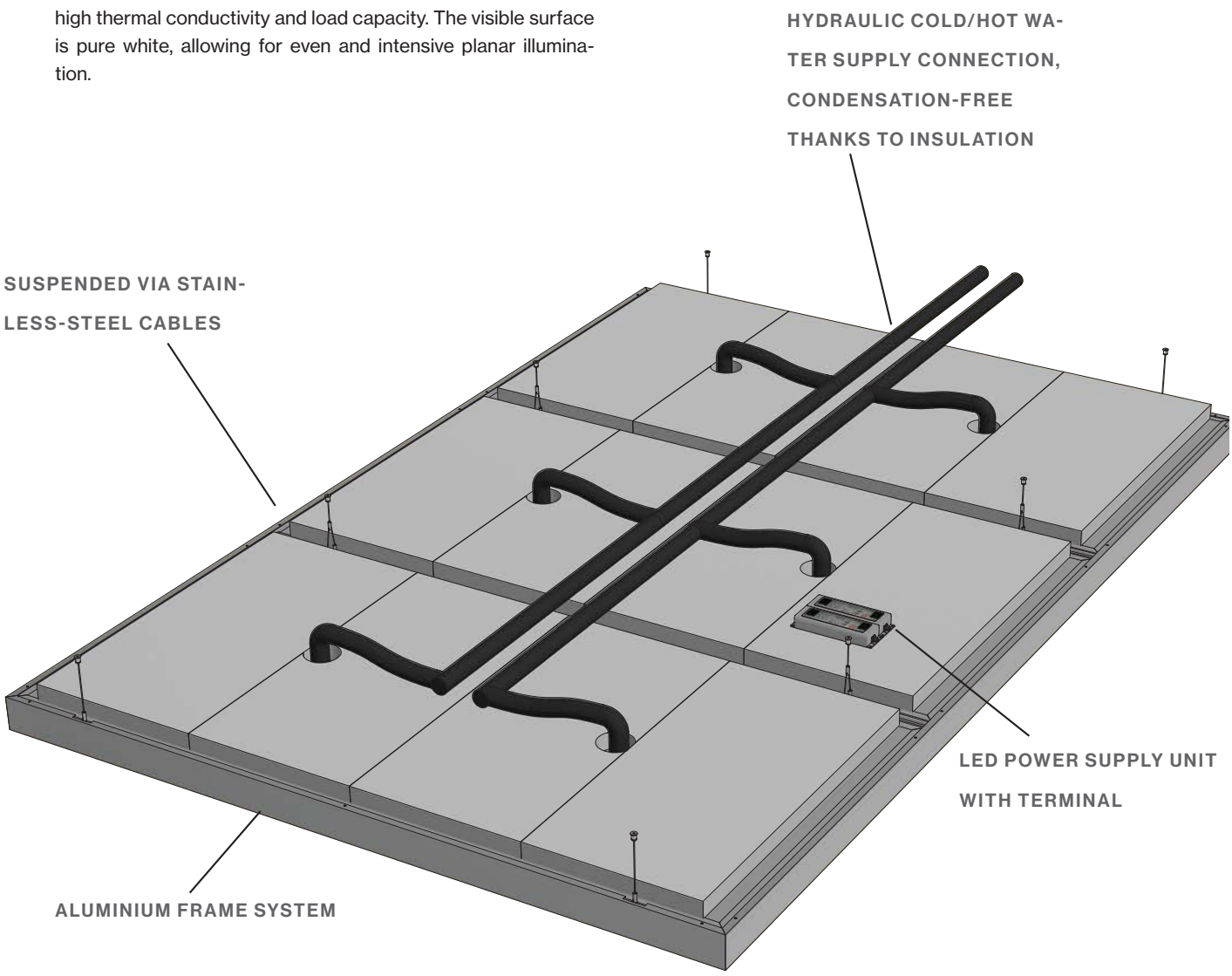
L	B	H
2159	1064	94 mm

FORMAT WITH BEZEL

L	B	H
2163	1068	100 mm

STRUCTURE

The interpanel element is a multifunctional composite element with tested interpanel connection technology and a standardised, assembly-friendly profile geometry. For the distribution of heating and cooling, a highly efficient, tried-and-tested system is utilized and water is used as a heat transfer medium. Thanks to novel materials, the composite structure exhibits a high thermal conductivity and load capacity. The visible surface is pure white, allowing for even and intensive planar illumination.

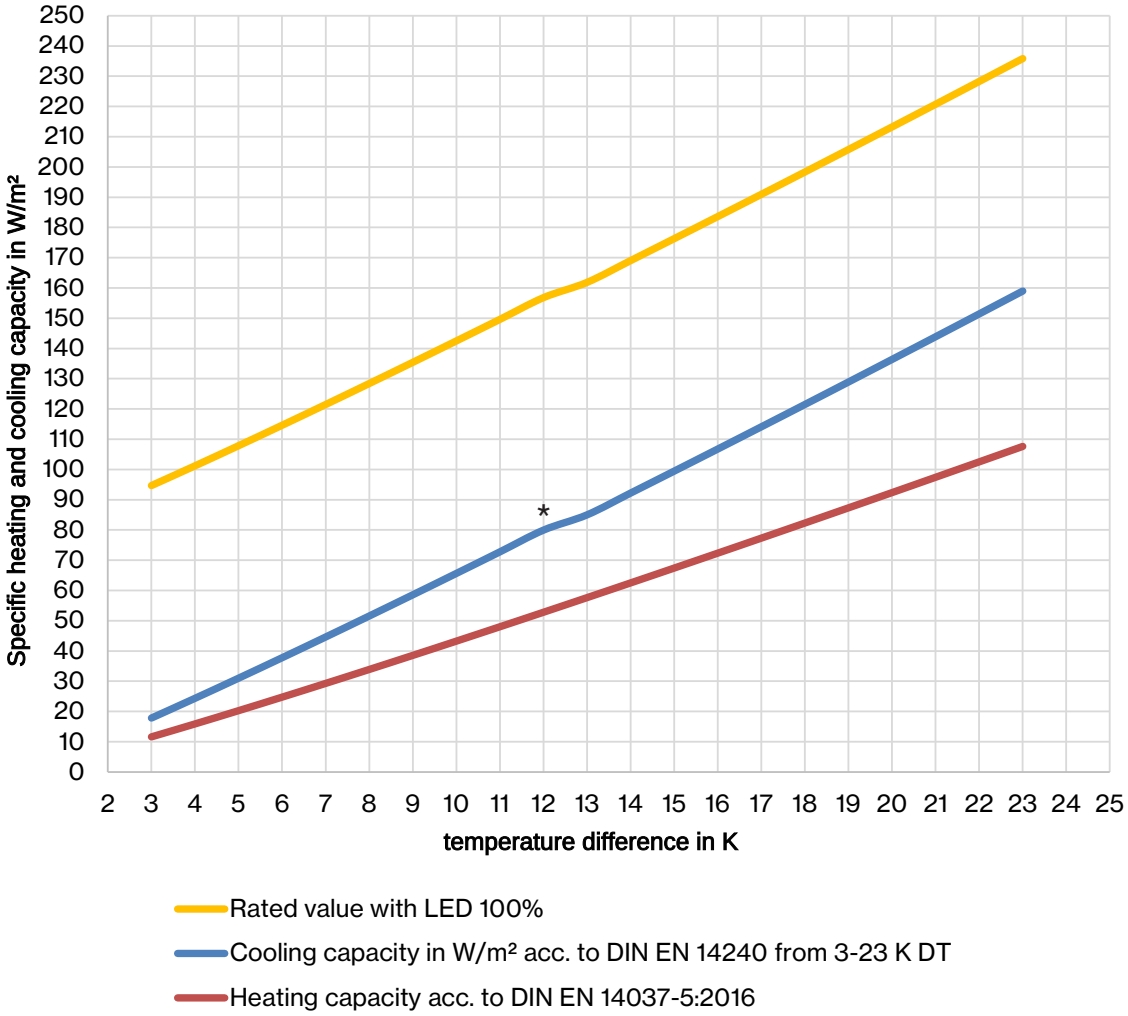


3-Element group panels, acoustic lining, dimmable LED power supply units, media connectors.
Suspended variant: 1 x Climatelight in the middle and 2 x Climatepanels

TECHNICAL DATA

COOLING & HEATING PERFORMANCE

PERFORMANCE DIAGRAM FOR RADIANT COOLING AND HEATING FOR TEMPERATURE DIFFERENCE OF 2 – 23 K



SPECIFIC COOLING CAPACITY

Thanks to the ability to go below the dew point temperature, significantly higher temperature differences are possible (up to 20 K instead of a maximum of 8 K).
This allows even a very high thermal load to be transported out of the room rapidly and silently where required, even at room teperatures of 22 °C and below. The specified values of the system with LED apply for the dimensioning of the cooling circuit, and constitute a rated value. The waste heat from the LED is to be added to the thermal load to be transported by the cooling network.

* Via various testing scenarios at 12 K<dt < 23 K.

SAMPLE READING

Cooling inlet temperature:	5°C
Cooling return temperature:	7°C
Average cooling water temperature =	6°C
Reference room temperature:	26 °C
Temperature difference:	26°C – 6°C = 20 K
Performance per m²:	136.4 W/m²

PERFORMANCE TABLE: COOLING AND HEATING

SPECIFIC COOLING & HEATING CAPACITY CLIMATELIGHT AND CLIMATEPANEL

	Specific cooling capacity		Specific heating capacity
	According to DIN EN 14240	Rated value with LED lighting*	According to DIN EN 14037-5:2016
K	5.1001	LED system at 240 W	3.473
n	1.0969	Rated values	1.095
Δt	W/m²	W/m²	W/m²
25	174.2	251.0	117.9
24	166.5	243.4	112.7
23	158.9	235.8	107.6
22	151.4	228.2	102.5
21	143.9	220.7	97.4
20	**136.4**	**213.2**	92.3
19	128.9	205.7	87.3
18	121.5	198.3	82.3
17	114.1	190.9	77.3
16	106.8	183.6	72.3
15	99.5	176.3	**67.4**
14	92.2	169.0	62.5
13	85.0	161.9	57.6
K	5.4487		3.473
n	1.018		1.095
Δt	W/m²		W/m²
12	80.0	156.8	52.8
11	72.8	149.6	48.0
10	65.7	142.5	43.2
9	58.6	135.4	38.5
8	51.6	128.4	33.9
7	44.7	121.5	29.2
6	37.8	114.6	24.7
5	31.0	107.9	20.2
4	24.4	101.2	15.8
3	17.9	94.7	11.6
2	11.5	88.4	7.4
1	5.4	82.3	3.5

*Rated value of Climatelight with LED lighting

The rated value with HCL LED lighting is specified for the dimensioning of the heating and cooling circuit. Hence, the waste heat of the lighting should be taken into account when dimensioning the cooling circuit, while also considering e.g. coincidence factors.

Hence, with the use of the Climatelight, the waste heat from the lighting does not have to be considered. At 6–13 W/m² of floor space for workspaces, this value can constitute up to 15–35 % of the total thermal load. With the direct removal of LED waste heat in the Climatelight, this allows the capacity used and the cooling capacity to be optimally dimensioned.
interpanel assists you with the optimal configuration of the system.

The specified performance values were determined according to prevailing standards by an accredited testing institute.

EXPLANATION OF SYMBOLS

Δt for cooling capacity Δθ
Δt for heating capacity ΔT
ΔT overtemperature (K)
Δθ undertemperature (K)
K constant
n exponent

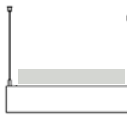
ACOUSTICS

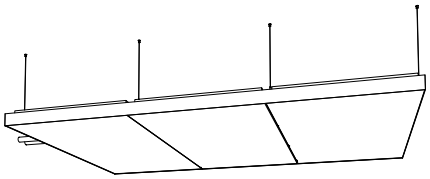
CLIMATEPANEL, CLIMATELIGHT, ACOUSTICLIGHT

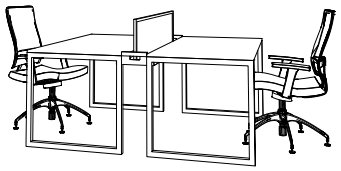
In combination with highly absorbent, acoustically effective cell foam, sound waves are reliably absorbed. This improves the room acoustics and understanding of speech thanks to shorter echo times. The absorbent material is laid on top of the suspended ceiling panels. A suspension height of approx. 350 mm guarantees an optimal effect.

Upon request, the acoustic lining can be configured in a custom colour. Higher acoustic absorption values and material data sheets are available upon request.

The Acoustic Light is available with higher acoustic absorption values (α_w= 1) is available upon request.

Acoustic noise absorption values for interpanel® Acoustic Light	
Drawing of ceiling section	
Weight in kg/m²	10-13
Dimensions in mm	2159*1064*144
Area in m²	2.29
Structural height in mm	100
Absorption material in mm	50
Panel thickness	100 mm





Frequency [Hz]	A_{obj} [m²]	alpha α_s [-]
100	1	0.42
125	0.8	0.33
160	1	0.42
200	1.3	0.54
250	1.2	0.5
315	1.3	0.54
400	1.5	0.63
500	2.4	1.00
630	2.4	1.00
800	2.2	0.92
1000	2.4	1.00
1250	2.3	0.96
1600	2.4	1.00
2000	2.7	1.13
2500	2.2	0.92
3150	2.2	0.92
4000	2	0.83
5000	1.8	0.75
α_w		**0.85**
NRC		**0.87**
SAA		**0.84**
Absorber class		B

TABLE 2: ACOUSTIC ABSORPTION DIN EN 354

CLIMATELIGHT AND CLIMATEPANEL

PERFORMANCE DATA LIGHTING

CHARACTERISTICS AND PERFORMANCE DATA FOR CLIMATELIGHT AND ACOUSTICLIGHT

Product features	
Luminaire type	Acoustically effective and actively cooled (type: Climatelight) Suspended LED luminaire with adaptive colour temperature
Net dimensions	2 159 x 1 064 x 94 mm approx. 26 kg/panel, 11–13 kg/m^2 ~
Connected load and light properties	Up to 480 W/panel (240 W per colour channel) Max. rated luminous flux 30 000 lm/panel Standard: CRI > 80 and >90 Optional: CRI > 95+ Colour temperature: 3 000 — 6 500 K Compatible to DALI, EnOcean, Bluetooth with app (IOS), light switch and touch control panel
Rated luminous flux	Standard: 15 000 lm – (dispersion approximates Lambert radiator)
For use at workplaces	Tested according to EN 12464-1
Luminaire	Aluminium frame composite system, Surface colour: white (similar to RAL 9016) Surface: anodised EV 1
Bezel frame	Frame bezel made of aluminium EV1 anodised Optional: solvent-free powder coating in RAL colours
Installation type:	System cable suspension, as hanging light or ceiling light panel Installation in grid ceiling with transition bezel
Electrical configuration Connection	BUS control system: DALI DT8 & DT6 Group and room-specific control: DALI HCL control unit and Bluetooth connection, Operation via touch control panel or EnOcean switch Mains connector with connection terminal
Building material class*	DIN EN 13501-1:2010-01 Flame-resistant, B-s2, d0
Acoustics*	Absorber class A, B Acoustic Light: α_w = 0.85–1.00 Climatepanel, Climatelight, α_w = 0.85
Integrated sensor technology	Luminance sensor Motion and presence sensor (HF/IR) Time-independent colour and brightness regulation, manual or automatic
Application scope	Office lighting, open-plan offices, co-working spaces, Sales rooms, foyers, reception areas, museums, Hotels, seminar and conference rooms, restaurants, Exhibitions, production and quality inspections

TECHNICAL DATA

CONTROL SYSTEM FOR INTERPANEL® HCL LIGHTING

In order to address the complex requirements of a modern HCL luminaire, interpanel developed its own decentralised control system.
With this system, it is possible to implement a conventional control solution via simple switches in the room. However, the system also offers numerous additional and unique features:

- » *The lighting colour is adapted fully automatically to the time of day depending on the location.*
- » *A light sensor regulates the brightness fully automatically to the desired value.*
- » *HF motion sensors with configuration of the sensitivity down to the most minute movements are extremely easy to integrate.*
- » *Additional components such as movement & lighting sensors or wireless switches can be retrofitted at any time.*
- » *Even without a control device in the room, the personalised app provides authorised users access via Bluetooth at all times.*
- » *User intervention can take place at any time or be intentionally restricted.*

Minimum configuration:

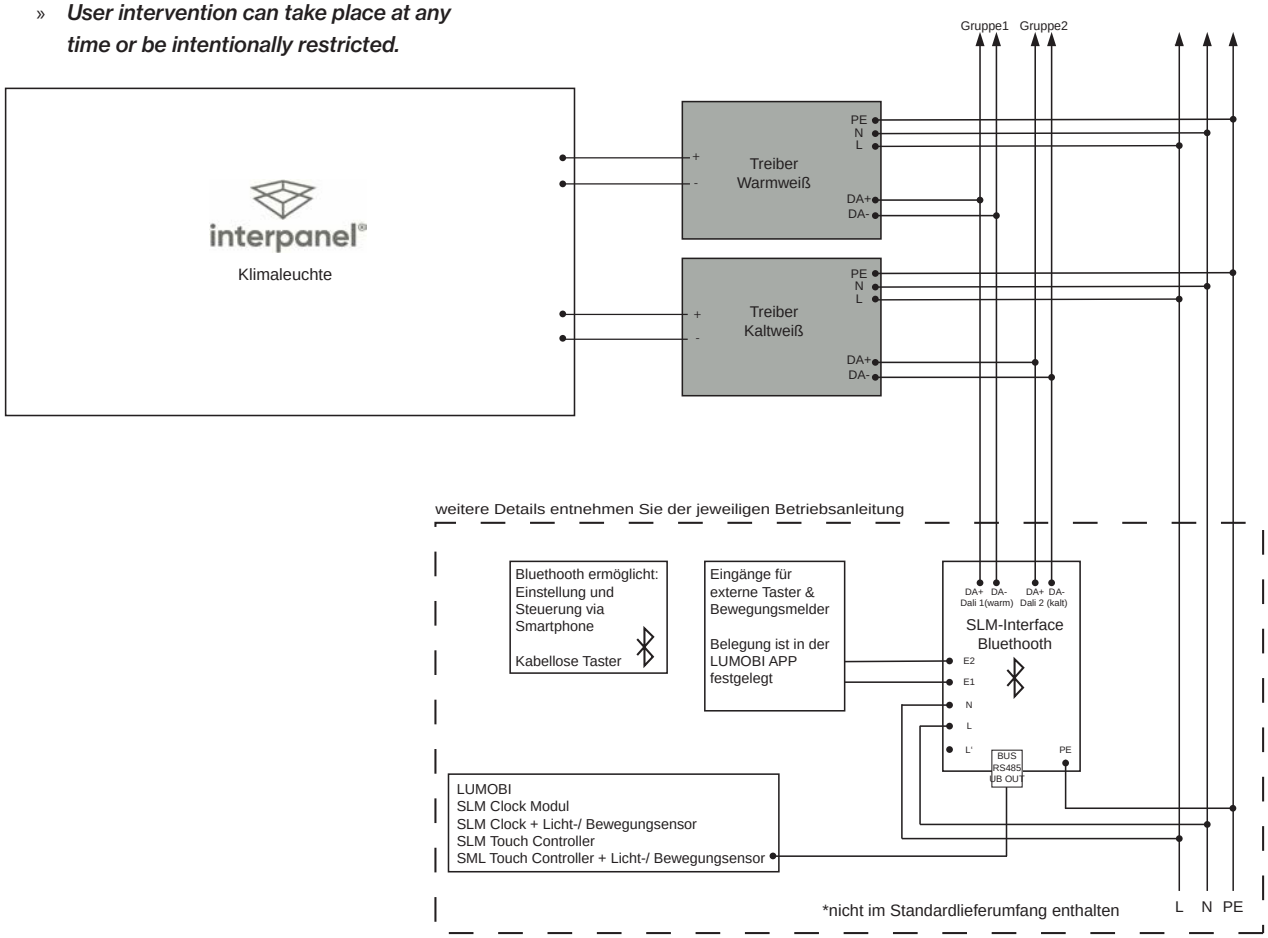
- » ***Interface and clock module or touch panel***

Expansion components

- » ***One or more motion & light sensors***
- » ***Touch control panel***
- » ***Wireless switches***
- » ***Standard switches***

ADVANTAGES

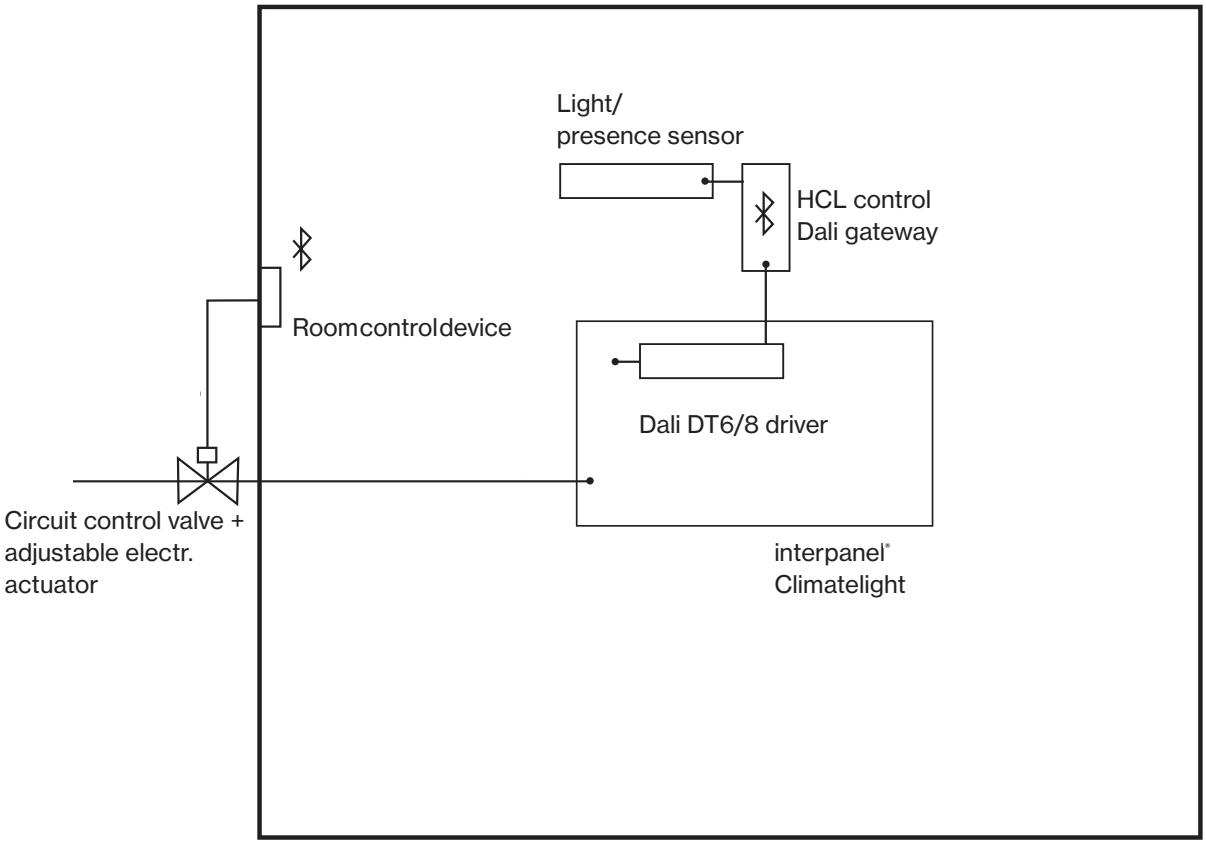
- » ***Satisfies even the most challenging requirements***
- » ***Easy to install***
- » ***Intuitive control of brightness and light colour***



CENTRALISED OR ROOM-SPECIFIC

Centralised and intelligent systems offer users a host of advantages. For example, they connect the desired sensors and control components in the entire building and manage them centrally. However, this type of control system is not an expedient and straightforward solution for every building.

interpanel offers users both integration into an overall building control system (e.g. Dali DT8/6) as well as the option of operating each room centrally and independently of the overall building. For this purpose, a custom light control system has been developed that is lean and tailored to user requirements in advance.



Controller

Light and presence sensor

Clock module

ASSEMBLY & INSTALLATION

GENERAL ASSEMBLY INSTRUCTIONS

COLD WATER/HOT WATER EQUIPMENT

The interpanel elements are integrated into a pipe network in a room-/zone-specific manner. A hot or cold water generator creates the required temperature differences. The cooling source can be freely chosen, and can be a heat pump, groundwater, or free cooling. In this regard, the required temperature difference and performance curve are to be taken into account. With the appropriate inlet temperature, extremely high thermal loads can be transported away reliably even during peak load periods. In times of low loads, extremely economical climate control can take place e.g. with efficient free cooling.

INSTALLATION

As a rule, the general installation guidelines, laws, standards, and regulations apply (e.g. DIN, EN, ISO, DVGW, TRGI, VDE and VDI) during planning, as well as provisions regarding environmental protection, regulations of the trade associations, and the regulations of local utility companies. Please also take note of all prevailing national and international laying, installation, accident prevention, and safety regulations during installation!

All materials used in the interpanel pipe network must be made of non-corrosive materials. Plastics, stainless steel, copper, brass, and red brass may be used. Other materials may cause the system to silt up, leading to failure.

INSTALLATION

For the mounting of the suspended ceiling sail, the installation instructions of the chosen product variant apply. The interpanel elements are packaged in a ready-to-install state. Dust-free installation is to be ensured. The surface is to be protected against damage and dents. The interpanel system is equipped with a plug coupling system at the factory. In cases where the polypropylene pipes are connected via thermal plastics welding, the implementation is governed by the Welding Guidelines DVS 2207-11 from the German Welding Society.

MATERIAL & TOOLS

The following tools are required for installation (please refer to the installation manual for more information):

- *interpanel elements*
- *Suitable lifting table & ladders*
- *Suspension accessories*
- *Suitable dowels and screws*
- *Appropriate plastic fittings & pipes*
- *Contact adhesive for insulation*
- *Insulation & insulation tape*
- *Spirit level*
- *Pincers*
- *Electric screwdriver and drill*

INSTALLATION STEPS

01. *Coordination with electrician for the commissioning of the LED lighting*
02. *Laying and insulating of hydraulic supply lines*
03. *Determine suspension heights*
04. *Fastening suspension cables*
05. *Installing flexible connecting hoses*
06. *Insulating flexible hoses according to plans*
07. *Inserting plugs into the ceiling element and insulating unused connectors*
08. *Fastening suspension to ceiling element*
09. *Hanging up the elements*
10. *Connect to water circuit according to plans*
11. *Glue insulating material to interpanel connector*
12. *Install acoustic lining*
13. *Pre-test with compressed air at 10 bar for 1 hour*
14. *Main test: for 10 minutes, hold 3 bars of water pressure, subsequently 10 bars for 4 hours.*
15. *Resting pressure = 3 bars up to commissioning*

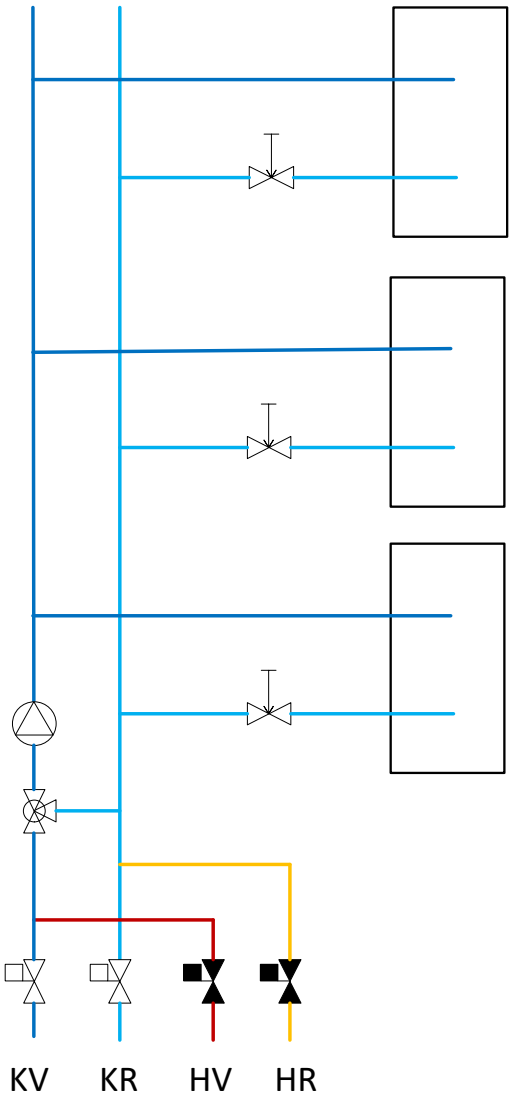
CONNECTION IN 2- AND 4-PIPE SYSTEM

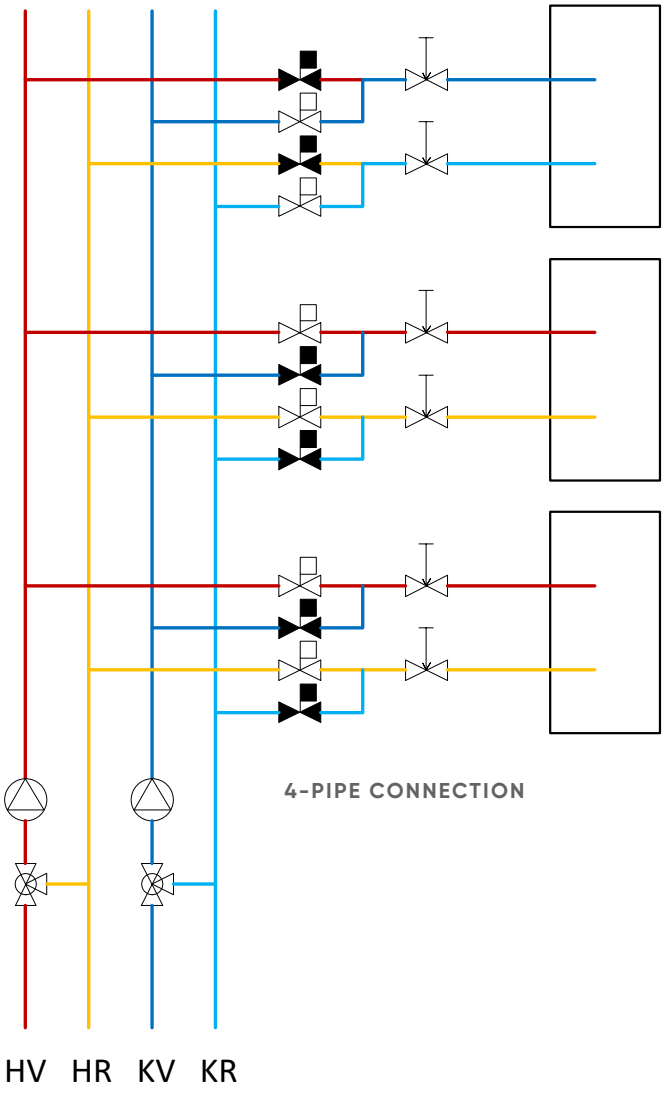
2-PIPE CONNECTION

Standard connection in 2-pipe system

With an inlet and return pipe and the connection of each individual module, an optimum effect is achieved with minimal installation effort. A switch between cooling and heating mode can be performed centrally. Depending on the switching area or zone, heating or cooling is performed. It is highly economical with reduced installation effort.

2-PIPE SYSTEM





4-PIPE CONNECTION

4-PIPE CONNECTION

Standard connection in 4-pipe system

With the 4-pipe system, two-way valves can be used to perform the switch for each room or smaller control groups.

- *Direct switching between heating and cooling*
- *Either room- or panel-specific heating and cooling*
- *The solution for zonal climate control*
- *Higher installation costs*

TECHNICAL DATA

Dimensions **Standard**	2 159 x 1 064 x 94 mm (standard) approx. 23–26 kg/panel, 11 kg/m² – filled
Installation	System cable suspension, as suspended ceiling light or integrated ceiling panel
Surface	Special film, pure white
Film*	Special polymer, diffusion-resistant, Flame-resistant design UV-resistant and anti-static Fully recyclable
Buildingmaterialclass* **Overall system**	DIN EN 13501-1:2010-01 Flame-resistant, B-s2, d0
Acoustics*	a_w 0.85 absorber class B a_w 1.00 absorber class B
Lighting **Power-LED** **Planar light***	Connected load up to 480 W/panel Usable luminous flux up to 30 000 lm/panel Standard CRI > 80+ & CRI > 90+ Optional CRI > 95+ Colour temperature: 3 000 K–6 500 K DALI DT 6/8, switch, dimmable Tested and approved for computer workstations*
Cooling capacity* **+ LED system**	DIN EN 14240 52/m² (Δθ: 8 K)* 136 W/m² (Δθ: 20 K)* 100 W/m² (Δθ: 15 K)* at 21°C room temp. 128.4 W/m² (Δθ: 8 K) 213 W/m² (Δθ: 20 K)
Heating capacity*	DIN EN 14037-5:2016 67 W/m² (ΔT: 15 K) 43 W/m² (ΔT: 10 K)
Reaction time	Less than < 5 minutes**
Inlet temperature	6 °C – 45 °C
Dew point control	Temperature below dew point always permissible**
Integrated sensor technology	Movement and occupancy light density
Positive operating pressure	3 bar 10 bar test pressure
Pipe system	Corrosion-proof configuration required
Connection	Flexible plug coupling, 10 mm 2- or 4-pipe system
* **	Test results upon request We look forward to receiving your enquiry at info@interpanel.com

EXPLANATION OF SYMBOLS

t_L	air temperature (°C)
t_U	ambient temperature (°C) = average radiation temperature = average surface temperature all ambient surfaces (°C)
$t_i = t_E$	interior temperature (°C) = (perceived temperature)
t_{HVL}	heating inlet temp. (°C)
t_{HRL}	heating return temp. (°C)
t_{KVL}	cooling inlet temperature (°C)
t_{KRL}	cooling return temperature (°C)
ΔT	overtemperature (K)
Δθ	undertemperature (K)

TEMPERATURE BELOW DEW POINT

Δt_{UTaup}	temperature below dew point (°C)
t_{Sur}	surface temperature (°C)
t_D	dew point temperature in °C threshold range = t_{Sur} - 1 K = t_D
t_{per}	perceived surface temperature (°C)

We are continuously developing and improving our products, which is why the specifications may change. All information is provided without guarantee.
The latest data sheets can be found on www.interpanel.com.
QR code:

Project:

ABW ARCHITECTS, Düsseldorf

All panels as a complete system
Cooling, heating, acoustics, and light

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AWARDS (SELECTED)

Top 25 global from 1600 #ConTechMap BUILTWORLD	2020
Global Top 100 Start-up	
SET-Award from dena, World Energy council, Berlin	2018
Winner of PERPETUUM (DENEFF) Energy Efficiency Prize	2018
Top 3, Handelsblatt Energy Awards, Berlin	2018
TV segment on einfach genial, Munich	2017
Winner of Scale-Track "Green Building", San Francisco	2017
Medical Valley Award Top 2	2017

A spin-off of Fraunhofer IBP

eXIST Existenzgründungen aus der Wissenschaft

Bundesministerium für Arbeit und Soziales

ESF Europäischer Sozialfonds für Deutschland

Zusammen. Zukunft. Gestalten.

Europäische Union