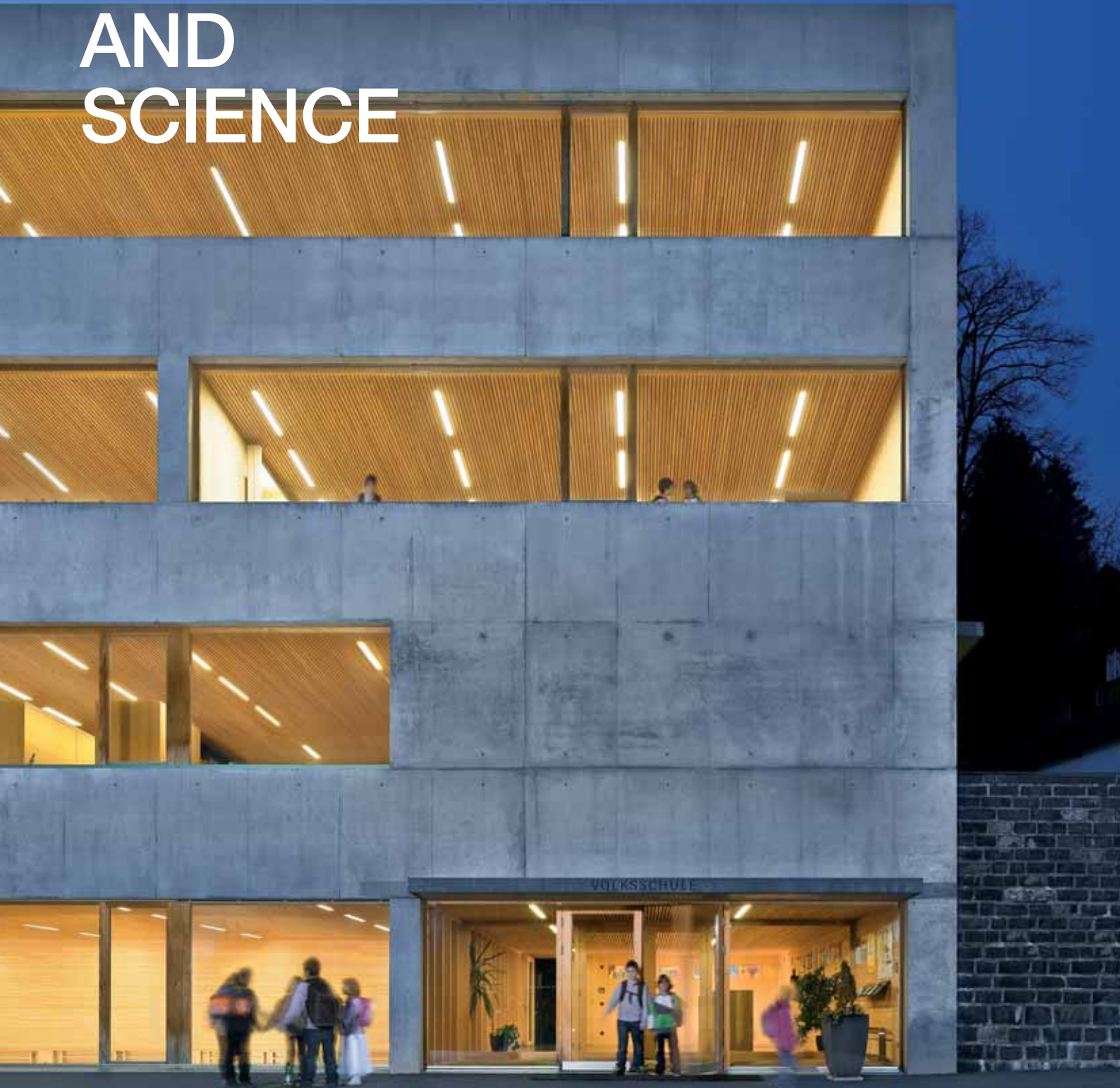


LIGHT FOR EDUCATION AND SCIENCE



ZUMTOBEL



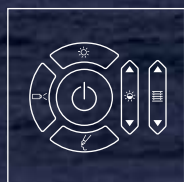
HUMANERGY BALANCE

Lighting solutions for
the balance between
environment, energy
and the individual.

Lighting quality Education and Science

The bright, uniform illumination of both horizontal and vertical surfaces is the basis for optimal visual and learning conditions.

Lighting scenes that promote concentration or relaxation according to requirements multiply the factors of fun and success during the process of learning. Easy to use lighting controls support teachers in their efforts to always find the most suitable lighting atmosphere.



Balanced ambient lighting creates a friendly reception and a pleasant atmosphere.



Wherever daylight supplies the room sufficiently, continuous rows can be dimmed.



Education and Science Energy efficiency

Efficient luminaires with electronic ballasts in combination with an intelligent lighting concept are the basis for an energy-conscious use of light. Lighting control combined with daylight and presence detectors reduces energy consumption to a minimum.



Exemplarily eco-friendly: the light switches off automatically during the breaks.



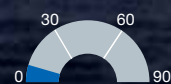
During the evenings a higher level of illumination aids the ability to concentrate.

ELI
Ergonomic Lighting
Indicator



Lighting quality assessed on the basis of five criteria:
A Visual performance,
B Vista,
C Visual comfort,
D Vitality,
E Empowerment

LENI
Lighting Energy
Numeric Indicator



Energy consumption in kWh per annum and per square metre, based on EN 15193.

7 WTC, NY ACADEMY OF SCIENCES, NEW YORK / USA

A. TAMBOSI ELEMENTARY SCHOOL, BOLZANO / I

ADULT EDUCATION CENTRE, ROSENHEIM / D

AUDITORIUM BUILDING, UNIVERSITY OF ROSTOCK, ROSTOCK / D

BILDUNG UND WISSENSZENTRUM CAMPUS, KREMS / A

BRISTOL UNI CHEMISTRY LAB / UK

REFERENCE LIST

BUNSCOIL AN TSLEIBHE DHUIBH, BELFAST / IRL

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CHELTENHAM SCHOOL / UK

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DOREN ELEMENTARY SCHOOL, DOREN / A

DOSHISHA UNIVERSITY, KYOTO / J

DROSTE-HÜLSHOFF GYMNASIUM, DÜLMEN / D

EIDGENÖSSISCHE TECHNISCHE HOCHSCHULE, ZÜRICH / CH

EURAC - EUROPEAN ACADEMY, BOLZANO / I

EUROPÄISCHES GYMNASIUM, BERCHTESGADEN / D

FACHHOCHSCHULE BENEDIKTBEUREN / D

FACHHOCHSCHULE STEYR, STEYR / A

FRAUNHOFER INSTITUT, MUNICH / D

GRAMMAR SCHOOL, BRUCKMÜHL / D

GUILDHALL SCHOOL OF MUSIC AND DRAMA, LONDON / UK

HOCHSCHULE DER KÜNSTE, BERN / CH

"IM BÜHL" SCHOOL HOUSE, ZÜRICH / CH

IMPERIAL COLLEGE, LONDON / UK

JOHN MADEJSKI ACADEMY, READING, BERKSHIRE / UK

KINDERGARTEN EGG, BREGENZERWALD / A

KÖSCHING SECONDARY MODERN SCHOOL, KÖSCHING / D

LEWIS & CLARK COLLEGE, PORTLAND / OREGON / USA

LOGISTICS INSTITUTE, HULL UNIVERSITY, HULL

MARYLAND INSTITUTE COLLEGE OF ART (MICA), BALTIMORE / USA

PÄDAGOGISCHE HOCHSCHULE THURGAU, KREUZLINGEN / CH

PLYMOUTH UNIVERSITY, PLYMOUTH / UK

RHODE ISLAND SCHOOL, RHODE ISLAND / USA

RYCHENBERG AND IM LEE CANTONAL SCHOOLS, WINTERTHUR / CH

SOUTHERN OREGON UNIVERSITY, ASHLAND / OREGON / USA

SPECIAL BOARDING SCHOOL MARIATAL, KRAMSACH / A

STIFTUNG FRIEDHEIM WEINFELDEN, WEINFELDEN / CH

STRAIDHAVERN PRIMARY SCHOOL, BELFAST / IRL

SYMFONIA SCIENCE AND MUSICAL EDUCATION CENTER, KATOWICE / PL

THE SEATTLE PUBLIC LIBRARY – CENTRAL LIBRARY, SEATTLE, WA / USA

THE UNIVERSITY OF EDINBURGH, HUGH ROBSON BUILDING, EDINBURGH / UK

THINK LAB, SALFORD UNIVERSITY, MANCHESTER / UK

UNIVERSITY OF LINCOLN, LINCOLNSHIRE / UK

UNIVERSITY, LAUSANNE / CH

UNSW – CENTRAL LECTURE BLOCK, SYDNEY / AUS

VICTORIAN UNIVERSITY OF TECHNOLOGY, MELBOURNE / AUS

VILLA MON REPOS, BLED / SLO

VOCATIONAL SCHOOL, BAD RADKERSBURG / A

VOCATIONAL SCHOOL, FELDBACH / A

VOCATIONAL SCHOOL, GLEINSTÄTTEN / A

VOCATIONAL SCHOOL, HARTBERG / A

WEST LONDON ACADEMY, LONDON / UK

WIFI, INNSBRUCK / A

YEOMAN PARK SCHOOL, NOTTINGHAM / UK

YEOMAN PARK SCHOOL, NOTTINGHAM / UK

LIGHT FOR EDUCATION AND SCIENCE

Intelligent control systems combining daylight and artificial lighting have a decisive function in educational buildings. Since desks are often arranged in a flexible way, classrooms must be uniformly lit so that glare-free lighting and thus optimum learning conditions are ensured in all situations. Individual lighting possibilities with intuitive control units should complete the lighting spectrum for the various areas and activities.



ECOLE JEAN ZAY | Beaumont, Paris / F



TOPEHLEN SCHULE | Eben-Ezer / D



UNIVERSITY OF LINCOLN | Lincolnshire / UK



DOSHISHA UNIVERSITY | Kyoto / J



ROYAL NORTHERN COLLEGE OF MUSIC | Manchester / UK



CITÉ DE L'ARCHITECTURE ET DU PATRIMOINE | Paris / F



SOUTHERN OREGON UNIVERSITY | Ashland / USA



LANDESBERUFSSCHULE FÜR DAS KUNSTHANDWERK | St. Ulrich / I



HOCHSCHULE DER KÜNSTE | Bern / CH

Light for all forms and aspects of education and training

School and training facilities consist of many individual functional areas with highly diverse lighting requirements. Zumtobel provides a wide range of innovative lighting tools for improving quality in all rooms and zones while simultaneously increasing energy efficiency.

Classrooms and Special Subject Classes	High quality light is a fundamental prerequisite for achieving optimal learning conditions in classrooms. According to the type of school and usage, special needs must be fulfilled in addition to the basic requirements of good lighting.	14
Auditoriums, Lecture Halls and Libraries	Here light takes on the task of accelerating the flow of information, while illuminating rooms in a functional and pleasant way.	30
Corridors and Circulation Areas	Light exerts a significant influence on the first, decisive impression and also takes on the function of aiding orientation in these areas.	34
Lounge Areas and Events Rooms	A wide variety of lighting scenes promotes a multi-faceted room design for various room uses.	36
Refectories and Cafeterias	Light aids relaxation between the individual phases of learning. An inviting lighting scene is part and parcel of attractive design.	40
Staff Rooms and Administration	In administrative areas where a wide range of activities are carried out, a high level of flexibility and a communicative atmosphere go to form a perfect solution.	42
Sports Halls	Demands placed upon the lighting of halls increase in line with the widening diversity of sport types and events.	44

The joy of learning. A lifetime long.

Lea. 7 years old.



Robin. 8 years old.



Christine. 23 years old.



“For me, learning always needs
a high degree of motivation.
So the surroundings are really
important.”

Christine



Chiara. 10 years old.

“Our old lamps always flickered so much. We played like we were in a disco. The new ones don’t do it. They’re boring.”

Chiara



Paul. 26 years old.



Franz. 50 years old.

“Learning used to be a necessary evil. Today it’s a sensible form of leisure activity.”

Franz



The future of schools

Issues and trends

Ecology Because of continuously increasing energy costs, the issue of energy consumption has become significantly more important. The aim is to budgetise energy in a responsible way and to operate the complete building complex as efficiently as possible. In connection with lighting, decisive aspects are the use of daylight and the efficient control of temperature.

Solution principle The combining of efficient luminaires and intelligent control systems to give a consistent lighting concept, reduces energy consumption to below statutory requirements.

Ergonomics Performance, the ability to concentrate and a sense of wellbeing all depend strongly upon the physiological and psychological condition of those learning. The influence of light upon health is undisputed, meaning that the quality of lighting becomes ever more important, and in this sense the right light is a question of the type of activity and the visual task involved.

Solution principle Good lighting conditions are more than just the basic prerequisites for concentrated reading and writing; appropriate lighting scenes can also demonstrably promote learning success.



DOREN ELEMENTARY SCHOOL / A
 Architect cukrowicz nachbaur,
 Bregenz / A

New forms of teaching New teaching content and learning methods free up classes and special-subject classes from fixed seating arrangements. Tables become mobile, frontal teaching decreases, and group communication is emphasised. Even teaching materials change: computers are used and homework is sent in per e-mail.

Solution principle Variable lighting solutions offer a pleasant environment for any type of activity: for work, for feeling at ease and for maintaining social contacts. Visual cornerstones in terms of lighting are the ratio of direct to indirect light components, vertical illumination, absence of glare, light colours and many other factors.

New technologies The achievements of modern technology become a part of everyday school life. Many processes can be automated, providing greater comfort, convenience and energy efficiency. Just as important is the need for change and flexibility in order to create personalised learning surroundings. The right solution: lighting scenes perfectly adjusted at the press of a button.

Solution principle Easy to understand, clearly designed control units, make the control of lighting seem like child's play. The press of a button is all that is needed to select the lighting scene appropriate for the activity, the form of lesson or the learning situation.

Ergonomic forms of teaching are advancing fast: children here stand on special cushioned floor coverings intended to feel similar to natural grass ground.



Daylight

Promoting a sense of wellbeing and saving energy

Natural light has the highest level of acceptance There is no substitute for intelligently used daylight. No other form of light is as uniform, no other light can cause such feelings of pleasantness. In addition, daylight takes on the role of a timer for the human biological rhythm, as such the use of daylight promotes a sense of comfort and wellbeing, increases performance, the ability to concentrate and establishes a link to the outside world. LUXMATE, the Lighting Management System by Zumtobel, is specialised in taking advantage of the benefits of daylight and at the same time avoiding disturbing aspects such as glare or the uncontrolled warming of rooms.

The Bavarian School Initiative "In Great Shape" has proved that using daylight is highly effective. It has demonstrated how health, the ability to concentrate and how the school and learning environment can be significantly improved by plenty of exercise and the use of daylight.

Dimming level of luminaire rows

left 100 %

right 100 %



2006

School class in Sonthofen / D before refurbishment.

Constant energy consumption of:

16.4 W/m²

left 70 %

centre 90 %

right 100 %



07:45

After refurbishment: if daylight is not sufficient for complete illumination, the necessary quantity of artificial light is supplemented.

6.6 W/m²

50 %

75 %

100 %



09:30

Daylight becomes continuously more intensive. The dimming level of the luminaires close to the windows is automatically reduced via the lighting control system.

5.7 W/m²

The example of the refurbishment of the **secondary school in Sonthofen** shows how energy consumption for lighting could be reduced on average to 6.53 kWh/m²a with the intelligent use of daylight. Compared to the situation before refurbishment, lighting alone accounted for 53 % of energy savings.

before refurbishment

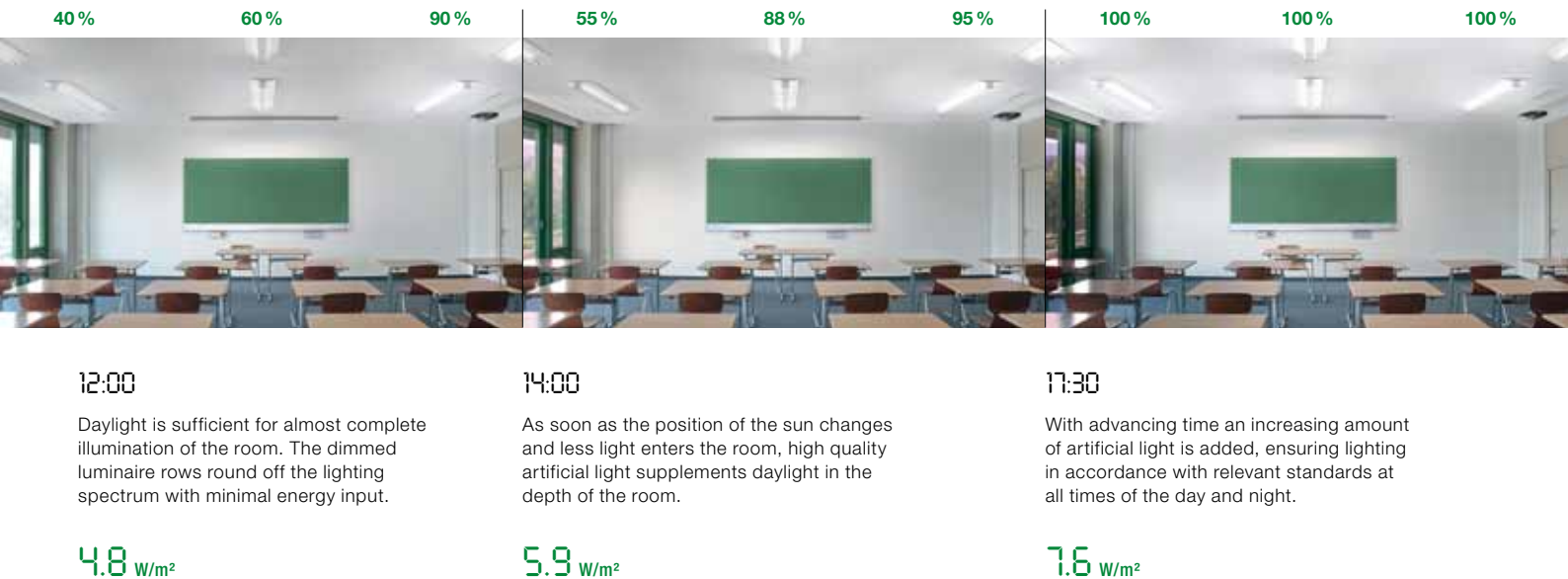
13.7 kWh/m²a

after
refurbishment

6,5 kWh/m²a

Energy consumption in kWh/m² per year

Daylight offers the greatest potential for saving energy In addition to its many qualitative strengths, use of daylight also offers quantitative advantages. Using the natural and free resource of daylight means a maximum energy saving. This is accomplished to perfection where intelligent control strategies are put to use combined with corresponding protection by blinds.





Lighting scenes at the touch of a button



TECTON continuous-row lighting system
Design: Nicholas Grimshaw & Partners



New media are a permanent feature of modern schoolday life. The use of computers and projectors is just one of the many reasons for installing an intelligent lighting solution or refurbishing one. Modern light adjusts adaptively to various activities and supports alterations in teaching methods with suitable lighting scenes. As the technology itself is becoming ever more complex, it's control should remain easy and intuitive. The DIMLITE lighting control system makes typical lighting scenes available for teaching at the touch of a button, thus creating the best possible conditions for a continuously pleasant working environment.

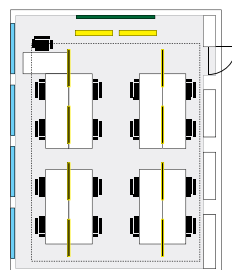
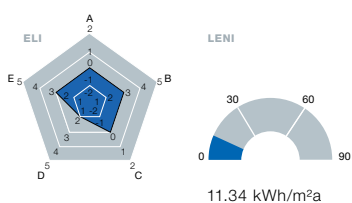


ATERT LYCÉE, REDINGEN / L

Architect ARCO-Architecture Company, Luxembourg / L

11,34 kWh/m²a

Annual energy requirements of lighting



Luminaire TECTON 2/49 W continuous-row lighting system for general lighting and TECTON wallwasher 1/80 W for lighting of the blackboard in conformity with relevant standards

Lighting management DIMLITE School Kit (with daylight and scenes)

Room Illuminance 519 lx (without blackboard lighting)
Uniformity 0.59 (without blackboard lighting)

Blackboard Illuminance 513 lx
Uniformity 0.74
Glare UGR < 16

Maintenance factor 0.67

Facts

- At the press of a button, DIMLITE creates optimal learning conditions
- The modular TECTON continuous-row lighting system adapts its lighting spectrum to the various visual tasks in the classroom
- Refurbishments can be implemented simply and effectively



Lighting scenes at the touch of a button



TECTON continuous-row lighting system
Design: Nicholas Grimshaw & Partners



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Daylight-based general lighting

Lighting scene number 1 supplements available daylight with the optimal level of artificial light. Lighting conditions similar to daylight motivate pupils and also save energy.



Light for video projector presentations

Lighting scene number 2 is optimised for presentations using video projectors. The brightness level of general and blackboard lighting is reduced, and the room is dimmed.



Light for concentrated work

Lighting scene number 3 switches room lighting up to 100 percent. Such high brightness levels support concentration and promote undisturbed work.



DIMLITE School Kit



The DIMLITE School Kit includes all components for convenient and intelligent control of a classroom. The CIRCLE control point makes three lighting scenes available at the touch of a button. Their brightness levels can be manually adjusted if required, as such, it is easy for speakers to select the most suitable lighting scene for an optimal learning environment. Thanks to the intelligent control system, energy saving is a matter of course: automatic daylight-based and presence-based control reduce electricity consumption without compromise in terms of lighting quality, and the mains isolation facility avoids unnecessary stand-by losses. All control components such as sensors and control units are included in the DIMLITE School Kit package.



CIRCLE control point School Kit

With three scene keys and two rocker dim switches, the innovative CIRCLE control point takes on all elementary functions of a complex control panel, thus taking the place of several controllers and buttons.



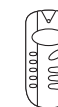
Light sensor

The sensor aligned to the window measures incident daylight and uses these values to supplement the free daylight with the optimal quantity of artificial light.



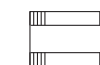
Multi-functional sensor

The sensor dependably monitors the presence of people via highly sensitive infrared technology. At the same time it receives the signals of the infrared remote control unit.



Remote control unit

The ergonomic IR-Touch infrared remote control unit has fewer buttons than a mobile phone. As such, all lighting components can be conveniently controlled without the need for a permanently installed control point.



Control

The basic module is the high-performance base unit of Zumtobel's complete solution for school classrooms. Versions for two or four channels are available.



Sustainable lighting solutions



MIRAL/MIREL louvre luminaires
Design: Studio Ambrozus

Saving energy is a key issue for public projects, especially in the case of refurbishments. Classrooms have a particularly high potential for this. Merely replacing old luminaires with modern products such as MIRAL or MIREL louvre luminaires increases the efficiency of the lighting solution, lengthens its maintenance intervals and offers more comfort and convenience. As well as innovative materials, reflectors and optics, the selection of lamps and ballasts also contributes to reducing energy consumption. The dimming of luminaires also leads to a highly sustainable solution, because their energy consumption occurs to 90 % during operation, and both manual and presence or daylight based dimming has tangibly positive effects on a lighting solution's energy balance.

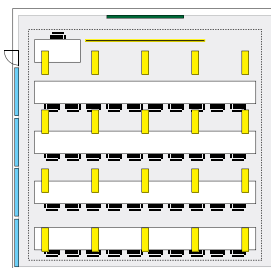

KHBO – KATHOLIEKE HOGESCHOOL BRUGGE OOSTENDE / B

Architect Tijdelijke Vereniging S.A.R. – De Vloed / B

Lighting design Studiebureau De Klerck Engineering, Brugge / B

11 kWh/m²a

Annual energy requirements of lighting


Luminaires MIREL 2/28 W recessed louvre luminaire for general lighting and MIREL 1/80 W recessed wallwasher for blackboard lighting

Lighting management DALI TLC, LSD light sensor, manual dimming

Room	Illuminance 430 lx
	Uniformity 0.70
Blackboard	Illuminance 512 lx
	Uniformity 0.71

Maintenance factor 0.67

Facts

- The energy efficiency of modern luminaire technologies is up to 40 percent greater than with older systems
- With refurbishments, luminaires can simply be replaced with little installation effort



Light for learning and a sense of wellbeing



MELLOW LIGHT IV
Design: Studio & Partners

Similar to natural daylight, MELLOW LIGHT IV creates a pleasant atmosphere in any space. Balanced luminance levels and shadow details increase people's sense of wellbeing and at the same time support the capacity for performance and concentration of those learning. Colour temperatures corresponding to daylight also play an important part. A further central feature of a high quality lighting solution for classrooms is good illumination of blackboards. Reflections often impair visual conditions on vertical surfaces. Lighting in accordance with standards makes reading easier and ensures that pupils do not tire so easily.

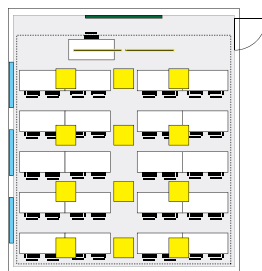
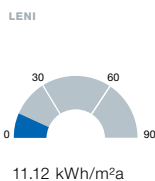
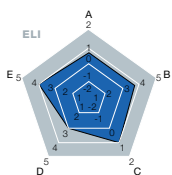
**LWFS KLEINRAMING / A**

Architect Architekt Radler / Kowatsch Ziviltechniker GmbH, Linz / A

Lighting design Project Bureau Ing. Plankenauer Gerhard, Haid / A

11.12 kWh/m²a

Annual energy requirements of lighting



Luminaires General lighting similar to daylight by MELLOW LIGHT IV 1/55 W,

MIRAL 1/80 W surface-mounted wallwasher for illumination of the blackboard

Lighting management DIMLITE School Kit (with daylight, presence detector and manual dimming)

Room Illuminance 514 lx
Uniformity 0.67

Blackboard Illuminance 533 lx
Uniformity 0.71

Maintenance factor 0.67

Facts

- Uniform and bright illumination of the room and blackboard surfaces according to relevant standards is a prerequisite for undisturbed learning
- Natural lighting similar to daylight promotes the motivation and performance of pupils
- With the principle of lighting chambers, MELLOW LIGHT IV supports good visual perception of objects and facial features



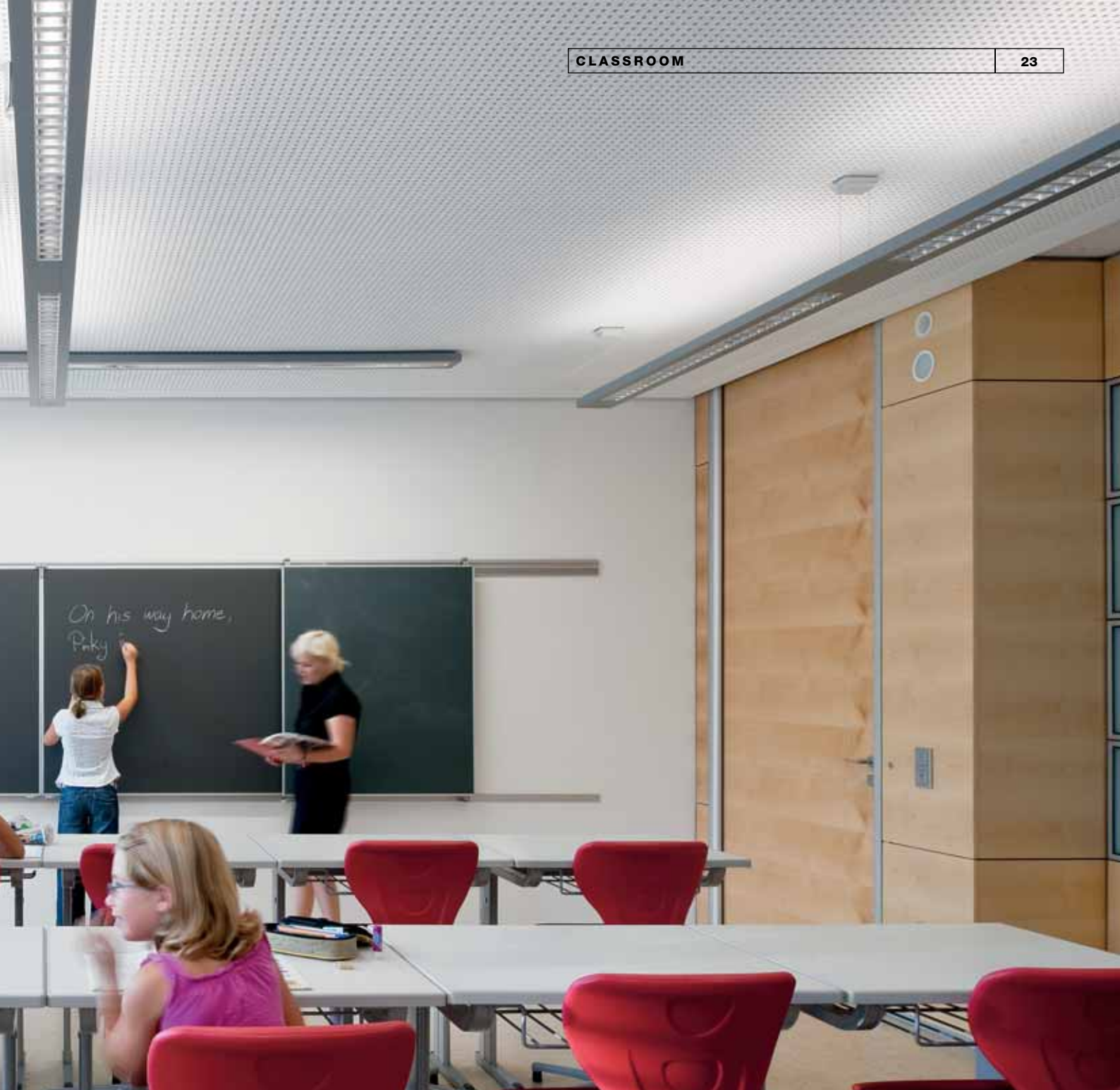
Intelligent use of daylight



CLARIS II louvre luminaire
Design: A•G Licht Bonn



The same fundamental planning principles apply to both refurbishment and new building projects. In order to achieve the highest possible level of energy efficiency and lighting quality, it is important to consider daylight and artificial light as one. Cross-system lighting and blinds control systems such as, LUXMATE, help in taking advantage of the benefits of daylight and in avoiding disturbing factors such as, glare and the uncontrolled warming up of rooms. As a part of this, intelligent control strategies integrating various types of blinds into their concepts, achieve maximum energy savings. Additional potential for saving energy is offered by automatic adjustment of the lighting level to the planned illuminance level. The solution is Maintenance Control.

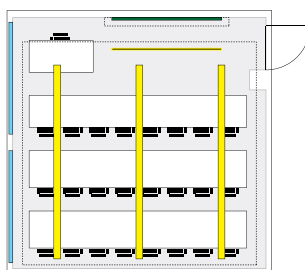
**COMMERCIAL COLLEGE, ST. ULRICH / I**

Architect Dr. Arch. Carlo Azzolini, Bolzano / I

Lighting design Dr. Arch. Carlo Azzolini, Bolzano / I

9.23 kWh/m²a

Annual energy requirements of lighting

**Luminaires** Direct/indirect general lighting with CLARIS II 2/35 W, CLARIS II 1/35 W wallwasher for blackboard lighting**Lighting management** LUXMATE LITENET lighting management for the complete building (with daylight-based/blinds management, Maintenance Control)

Room Illuminance 600 lx
Uniformity 0.43

Blackboard Illuminance 508 lx
Uniformity 0.69

Maintenance factor 0.67**Facts**

- The system for daylight based blinds control operating across all systems saves a high level of energy (in this specific example up to 47 %)
- The constant lighting control integrated in LUXMATE LITENET (Maintenance Control) reduces requirements for energy by a further 15 %
- Balanced lighting with direct and indirect components avoids unpleasant cave effects



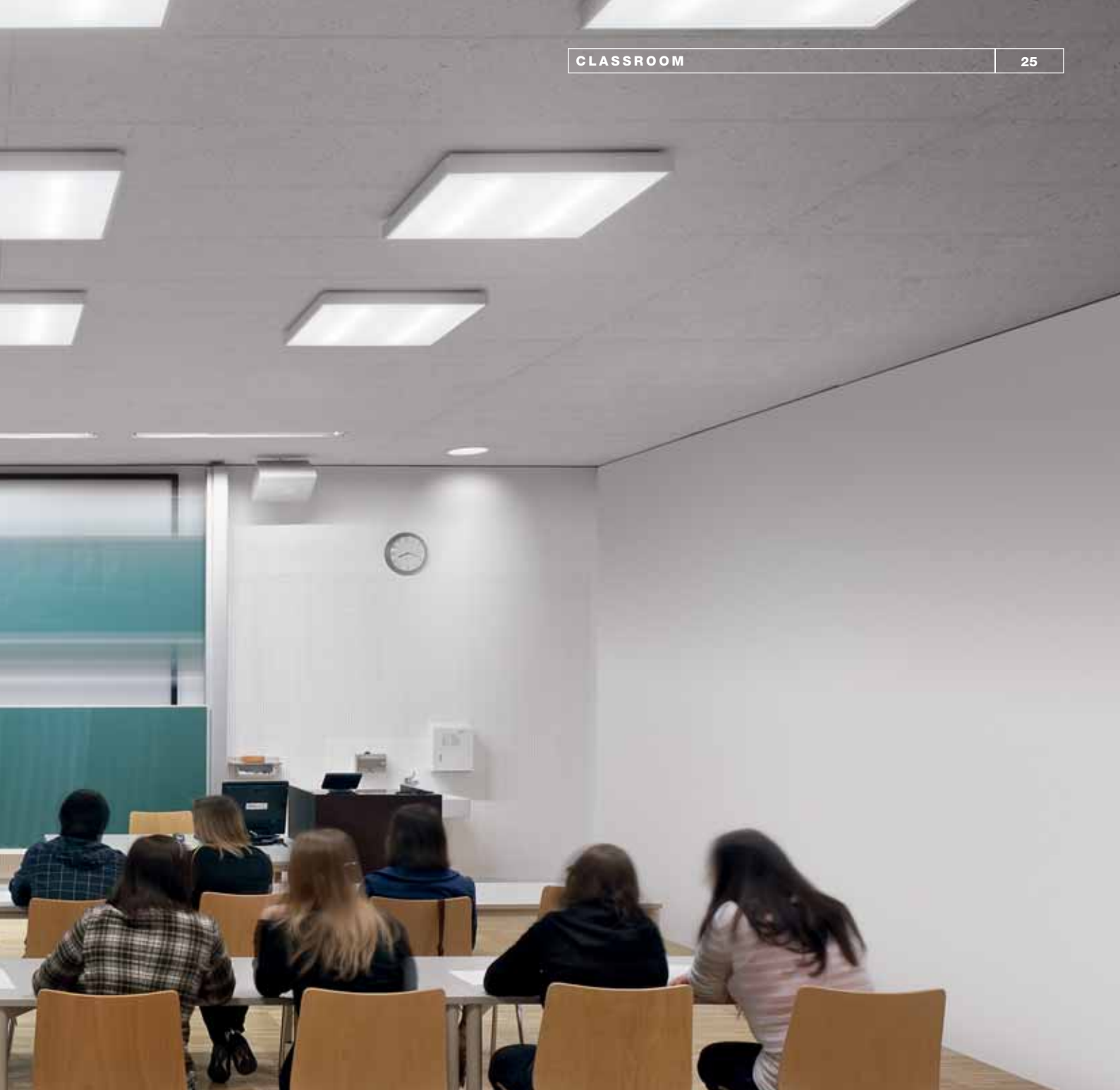
Light for flexible room concepts



LIGHT FIELDS waveguide/micropismatic luminaire
Design: Sottsass Associati



Modern methods of teaching place high demands upon the flexibility of people and rooms. Whether a case of individual or group work, entire class teaching or teamwork: optimal visual conditions are always required, even when rows of desks need to be rearranged and chairs moved about. Lighting that is uniform and glare free in all directions, offers perfect lighting quality for all room modifications. With intelligent lighting control, the lighting can be individually and flexibly adapted to prevailing conditions. Supplementary luminaires in the peripheral areas set emotional accents.

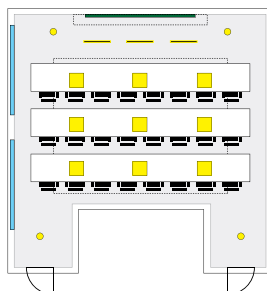


FACHHOCHSCHULE STEYR / A

Architect Werner Neuwirth, Vienna / A

6.78 kWh/m²a

Annual energy requirements of lighting



Luminaires LIGHT FIELDS 4/14 W surface-mounted waveguide/micro-prismatic luminaire for general lighting, MIREL FEW wallwasher for blackboard lighting, PANOS downlights for accent lighting of the peripheries

Lighting management LUXMATE LITENET lighting management for the complete building (with daylight, presence, scenes)

Room Illuminance 354 lx (without blackboard lighting)
Uniformity 0.454 (without blackboard lighting)

Blackboard Illuminance 502 lx
Uniformity 0.575

Facts

- Individually adaptable lighting scenes enable adjustment of the lighting to suit any room change
- The MPO+ optic eliminates glare perfectly, thus fulfilling requirements for PC workstations
- Lighting control for the complete building drastically reduces energy requirements (in this specific case by 67 %)



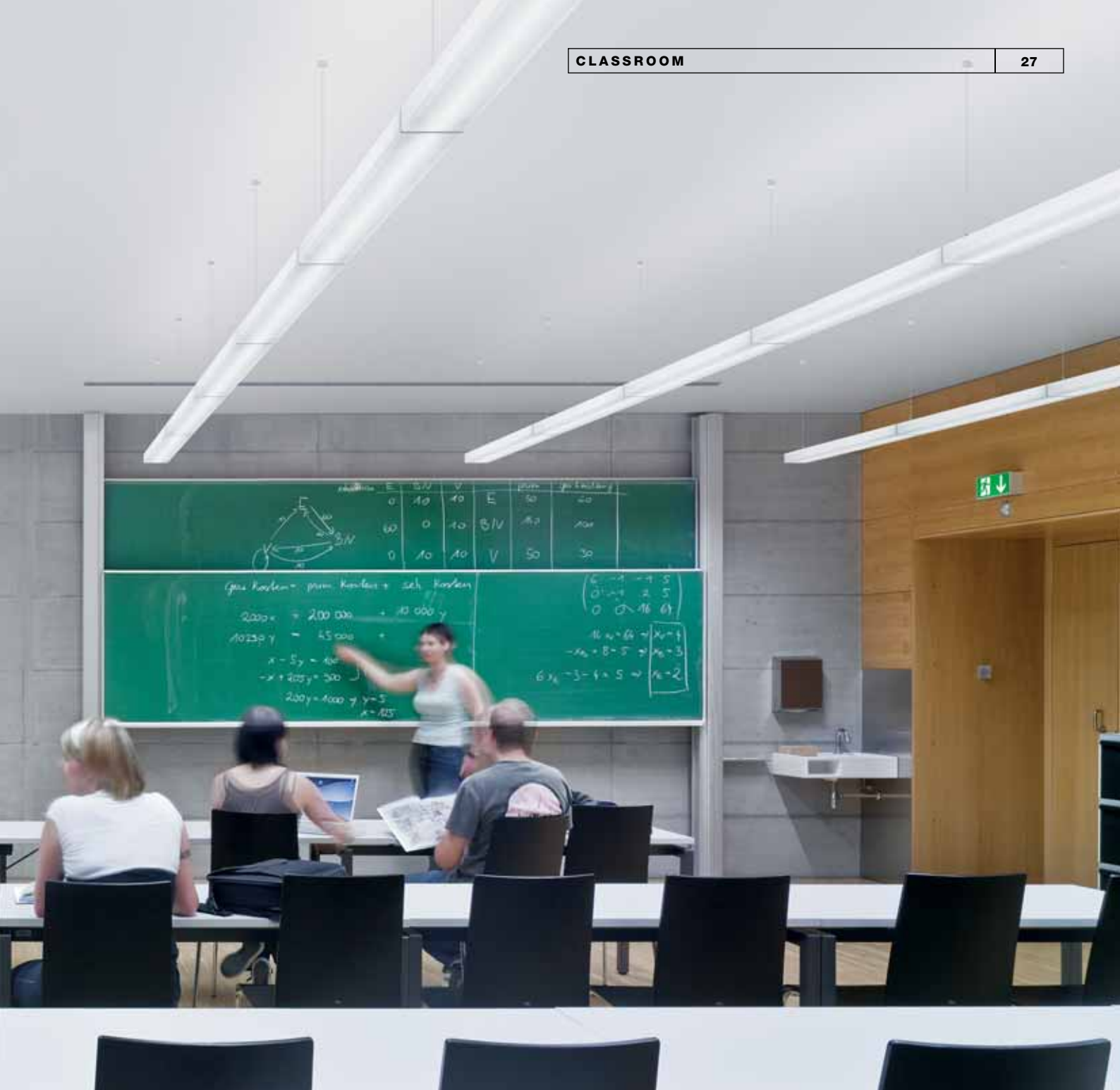
Efficiency and convenience at the highest level



ECOOS
Waveguide/micropismatic luminaire

Climate protection and CO₂ neutral energy balances are highly popular topics at the moment with local communities and private builders. They depend on energy efficient lighting solutions that simultaneously offer optimal learning and working conditions for pupils and teachers.

Even when the required lighting level of 500 lux for evening classes is achieved, intelligent lighting solutions, such as, the combination of ECOOS waveguide/micropismatic luminaires and DIMLITE lighting control exceed all benchmarks. This solution, intelligent and easily controlled, saves up to 58% of energy in comparison with the uncontrolled lighting solution. In terms of quality, it impresses with high direct lighting levels, indirect light and pleasant light distribution, as well as, good glare control.

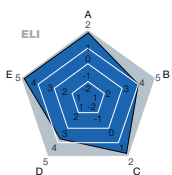
**FACHHOCHSCHULE DORNBRN / A**

Architect Walser + Werle Architektur ZT GmbH, Feldkirch / A

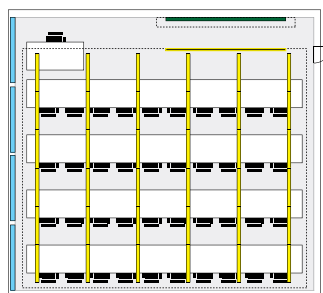
Lighting design Technisches Büro Helmut Hiebeler, Hörbranz / A

10.31 kWh/m²a

Annual energy requirements of lighting



10,31 kWh/m²a



Luminaires EC00S 1/35 W waveguide/micropismatic luminaire for general lighting, FEW 1/80 W wallwasher for blackboard lighting
Lighting management DIMLITE School Kit (with daylight, presence, CIRCLE control points and infrared remote control unit)

Room Illuminance 516 lx

Uniformity 0.546

Blackboard Illuminance 547 lx

Uniformity 0.69

Maintenance factor 0.67**Facts**

- With 90 % luminaire efficiency, ECOOS is one of the most efficient direct/indirect luminaires on the market
- The intelligent DIMLITE lighting control system for the classroom saves a high level of energy (in this specific case 58 percent)
- Indirect light components have a positive effect upon shadow detail and spacial effects



Light for colours and forms



PERLUCE diffuser luminaire
Design: Studio Ambrozus



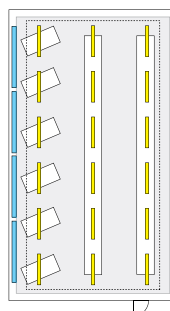
In special subject classrooms with an emphasis on manual skills, the main task of the lighting solution is to make small objects and minimal differences of colour easily recognisable. Large vertical lighting components, balanced shadow detail and good colour rendition are essential. Luminaires with electronic ballasts avoid stroboscopic effects on rotating objects. According to the type of visual task and material being worked upon, the luminaire must also be reliably protected against catching fire and soiling caused by fine dust particles.


BERUFSSCHULE MARKTOBERDORF / D

Lighting design Ingenieurbüro Körbl und Feneberg, Füssen / D

19.58 kWh/m²a

Annual energy requirements of lighting


Luminaires PERLUCE D 1/80 W IP-protected diffuser luminaire for general lighting

Lighting management LUXMATE LITENET lighting control

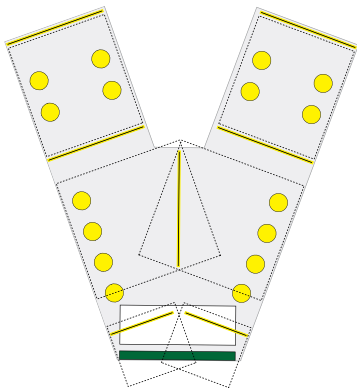
Room Illuminance 505 lx
Uniformity 0.620

Facts

- Good colour rendition supports manual work
- The luminaires are well protected from soiling and damage
- Direct and indirect lighting components support manual capabilities and create a pleasant room effect

Presenting and representing

A good lighting solution shows its worth before the actual event. Properly illuminated rooms, stairs and circulation routes guide visitors safely to their places. During presentations, the light becomes a tool for the speaker for the individual and flexible adaptation of lighting and room dimming. The essential factor for any lighting situation is good vertical illumination of the presentation surfaces. In a dimmed room, additional wall lights give a feeling of security without distracting attention or disturbing concentration. Exits demarcated by escape sign luminaires and emergency luminaires facilitate quick evacuation in emergency situations.



38.50 kWh/m²a

Annual energy requirements of lighting

Luminaires MIROS 40 x 1/150 W projector-mirror system,
TECTON 46 x 2/80 W ST continuous-row lighting system,
ARTSIGN escape sign luminaire

Lighting management LUXMATE LITENET lighting control,
ONLITE emergency lighting

Room Illuminance 528 lx
Uniformity 0.46

Podium Illuminance 393 lx
Uniformity 0.65

Facts

- Good room illumination with separate lighting of stairs as well as emergency lighting ensure orientation and safety in all situations
- Lighting and room dimming can be individually and flexibly adjusted
- The light assumes highly differing roles, allowing all possibilities ranging from prestigious event lighting to the lighting of presentations

KHBO – KATHOLIEKE HOGESCHOOL BRUGGE OOSTENDE / B

Architect Tijdelijke Vereniging S.A.R. – De Vloed / B

Lighting design Studiebureau De Klerck Engineering, Brugge / B







Light for people and media

Bright, natural light, and above all, daylight create a pleasant atmosphere for reading and working. The advantages of glare-free and reflection-free lighting can be seen on any page of a book or screen. Specific shelf lighting with asymmetrical distribution wallwashers meets the needs of vertical illuminance for reading the spines of books and supports orientation in the room. Further benefits can be provided by a central Lighting Management System that matches daylight and artificial light, and controls the lighting in coordination with the blinds. Emergency luminaires mark the escape routes and guide people to the exits.



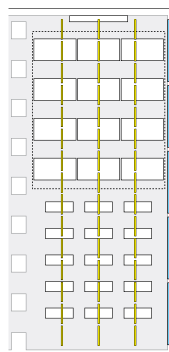
HOGESCHOOL GENT, CAMPUS SCHOONMEERSEN (OLC), GENT / B

Architect cv baro – bureau voor architectuur en ruimtelijke ordening, Gent / B

Lighting design Technum, Sint-Denijs-Westrem / B

37 kWh/m²a

Annual energy requirements of lighting



Luminaires TECTON RL 2/49 W continuous-row lighting system, ARTSIGN escape sign luminaire

Lighting management LUXMATE LITENET lighting control, ONLITE emergency lighting

Reading area Illuminance 681 lx
Uniformity 0.42

Book shelf Illuminance 201 lx
Uniformity 0.67

Facts

- High quality optics create glare-free and reflection-free light
- Separate, vertical lighting of the shelf walls simplifies locating books
- Balanced lighting with direct and indirect components avoids unpleasant cave effects

Akademia Muzyczna

im. Karola Szymanowskiego
CENTRUM NAUKI I EDUKACJI MUZYCZNEJ

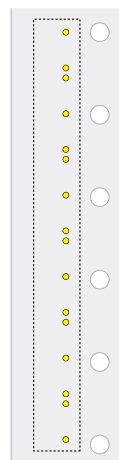
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- wypożyczalnia	piętro 2	↑
komputerowa	piętro 2	↑
rtowa - Audytoryjna	piętro 1	↑
ki	piętro 1	↑
ja	parter 0	↑
yczny	parter 0	↑
	parter 0	←





Frequency of use as a means for saving

Long opening times in schools and educational facilities often lead to lighting in circulation areas being left on 24 hours a day. The best way to save a high level of energy here is an intelligent combination of lighting control and presence-based control. Light is automatically switched on and off depending on detected movement. By doing this, zones and rooms are always brightly lit for users without wasting energy. They are visually enhanced and enlarged by the light and visitors can find their way around a lot more easily and simply, even in emergency situations. Escape routes are marked and illuminated in conformity with relevant standards. Presentation and exhibition areas demand the special attention of the lighting designer. A flexibly designed lighting installation even presents changing exhibits in the right light.



37.28 kWh/m²a

Annual energy requirements of lighting

Luminaires PANOS HF 2/26 W, ARTSIGN

Lighting management LUXMATE LITENET lighting control, ONLITE emergency lighting

Corridor Illuminance 212 lx
Uniformity 0.70

Maintenance factor 0.67

Facts

- Intelligent presence-based control saves up to 40 percent energy
- Bright lighting avoids tunnel effects
- Linear arrangement aids orientation in the building



From daylight to artificial light

Foyers are often used as architectural figureheads. They determine the character of the building with attractive accent lighting gaining added importance. Many lighting designers set themselves the target of designing the transition between daylight and artificial light as naturally as possible. Daylight entering the room helps to create a pleasant atmosphere together with intelligent lighting control reducing energy requirements. Lighting with sufficient brightness also helps to avoid accidents.

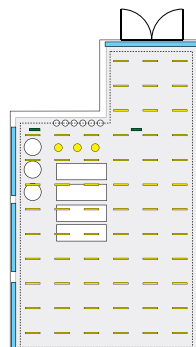
**FACHHOCHSCHULE DORNBIERN / A**

Architect Walser + Werle Architektur ZT GmbH, Feldkirch / A

Lighting design Technisches Büro Helmut Hiebeler, Hörbranz / A

16.60 kWh/m²a

Annual energy requirements of lighting



Luminaires SLOTLIGHT II 1/35 W light line, XENO spotlight, ARTSIGN escape sign luminaire

Lighting management LUXMATE LITENET lighting control, ONLITE emergency lighting

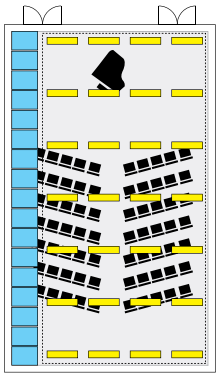
Corridor Illuminance 219 lx
Uniformity 0.52

Facts

- The intelligent use of daylight saves up to 50 % energy
- Prestigious lighting characterises the building
- Supplementary luminaires are the ideal solution for reading tasks

Setting the stage with light

Assembly halls and events rooms are focal points of communication. The school presents itself as an attentive host in this respect – also because of, and in fact, due to atmospheric lighting. Light is capable of dividing large rooms into zones, and with individually controllable lighting modules can also masterfully present a variety of events with light in various intensities and from various directions. Glare-free and reflection-free light for the stage area has the advantage that the view of speakers and actors onto documents and towards the onlookers is not disturbed.



12.46 kWh/m²a

Annual energy requirements of lighting

Luminaires LIGHT FIELDS 2/35 W recessed waveguide/micropismatic luminaire

Lighting management LUXMATE LITENET lighting control

Room Illuminance 520 lx

Uniformity 0.52

Maintenance factor 0.67

Facts

- The micro-pyramidal optic ensures reflection-free and glare-free light
- A control system makes the lighting solution flexible for a variety of events
- Accent luminaires create an atmosphere







Light that whets the appetite

Breaks are often very short. Light supports rapid regeneration in catering areas if it promotes relaxation and a sense of wellbeing. The high level of colour rendition is an added distinction to appetising meals. Due to a lot of communication taking place in these areas, the recognition of faces is very important. Shadow free lighting with balanced direct and indirect components aids in fulfilling these requirements in all aspects. Equipped as such with high technical lighting and design qualities, the lighting solution, together with the architecture, generates a cosy atmosphere for a pleasant stay.

Luminaires COPA high-bay luminaire, PANOS Q LF 1/26 W downlight
Lighting management LUXMATE LITENET lighting control,
 ONLITE emergency lighting

8.84 kWh/m²a

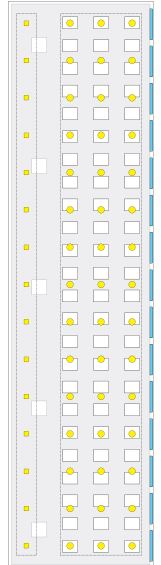
Annual energy requirements of lighting

Seating area Illuminance 348 lx
 Uniformity 0.48
Circulation areas Illuminance 162 lx
 Uniformity 0.57

Maintenance factor 0.67

Facts

- The atmosphere is cosy and light enhances the pleasant ambience
- Good colour rendition effectively emphasises appetising food
- Differentiated lighting supports zoning of the room



HOGESCHOOL GENT, CAMPUS SCHOONMEERSEN (OLC), GENT / B

Architect cv baro – bureau voor architectuur en ruimtelijke ordening, Gent / B



Before and after lessons

The staff room is a location for meetings between young and old, teachers and pupils. Various activities such as the planning of teaching units, correcting of work, computer work or the exchange of information all come together. High quality light plays a decisive role in creating pleasant room illumination for all activities and enables you to concentrate on difficult work tasks. Balanced components of direct and indirect light, as well as, good anti-glare properties, improve visual perception within the room.

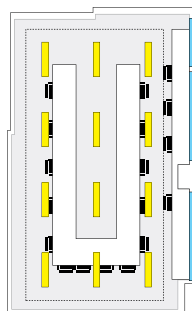


BÜNZMATT SCHOOL COMPLEX, BÜNZMATT / CH

Architect Cornelius Morscher Architekten AG, Bern / CH

14.38 kWh/m²a

Annual energy requirements of lighting



Luminaires LIGHT FIELDS 2/35 W pendant
waveguide/microprismatic luminaire

Lighting management DIMLITE lighting control

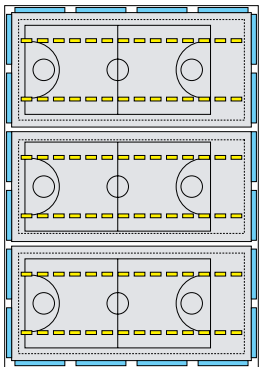
Room Illuminance 315 lx
Uniformity 0.47

Facts

- Uniformly illuminated ceilings, walls and floors create a pleasant lighting scene
- The light is free of disturbing glare
- The lighting scene can be adapted personally and intuitively

Light for a wide range of sports

A complete education encompasses highly diverse types of sport and forms of exercise. Requirements for the flexibility of the lighting solution increase in step with the variety of desired lighting levels. The key to effectively and keenly used sports facilities is an intelligent Lighting Management System that is able to adapt lighting levels to the specific type of sport. Ball-proof, robust luminaires with fluorescent lamps or high pressure discharge lamps, have proved to be most effective.



38.39 kWh/m²a

Annual energy requirements of lighting

Luminaires MIRAL 3/80 W surface-mounted sports facility luminaire for competition lighting in conformity with relevant standards

Lighting management LITENET lighting management for adapting lighting levels to specific types of sport

Room Illuminance 583 lx
Uniformity 0.533

Facts

- Intelligent lighting control effectively reduces energy consumption
- High illuminance levels with flexible lighting control meet the requirements of diverse types of sports and competition situations
- Modern lamps and ballasts form the basis for the careful handling of energy and personnel resources

SPORTHALLE KIRCHBERG / CH

Architect Arn + Partner, Münchenbuchsee / CH







ONLITE
Emergency Lighting



LUXMATE LITENET
Lighting Management



ONLITE
Emergency Lighting



LUXMATE LITENET
Lighting Management

ONLITE RESCLITE – maximum safety with a discreet design

The innovative LED emergency luminaires can be optimally integrated into the architecture thanks to their compact dimensions and discreet design. Three different lens types offer maximum performance for all applications. This means that with a minimum quantity of luminaires, optimum visual conditions are ensured in emergencies and the requirements of relevant standards are easily exceeded. The best part: RESCLITE luminaires operate completely independently of general lighting and Lighting Management Systems. Together with the low number of lighting points required, the very low installed load of the LED luminaires requires only very small supply systems. This saves costs and protects the environment.

RESCLITE escape

LED emergency luminaire for escape route lighting according to EN 1838.

Maximum luminaire distance:
up to 23 m > 1 lx



RESCLITE anti-panic

LED emergency luminaire for anti-panic lighting according to EN 1838.

Maximum room illumination:
up to 170 m² > 0.5 lx



RESCLITE spot

LED emergency luminaire for display lighting according to EN 1838.

Maximum object illumination:
Ø up to 3 m > 5 lx light



ONLITE ARTSIGN

LED escape sign luminaire
Designed by Matteo Thun



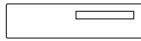
ONLITE central CPS

Emergency lighting systems
with central supply



A large selection of LED escape sign luminaires and emergency luminaires – teamwork between high-tech and design

The comprehensive ONLITE range has a common basis: high quality materials and superior design allow an unusually successful and discreet integration of luminaires within the architecture. In emergencies, the outstanding LED lighting technology from the escape sign luminaires ensures a high quality uniform illumination of pictograms and optimal orientation. The compact design and maintenance-free operation of the LED luminaires is an added argument for their use in corridors and lounge areas in educational facilities. The ONLITE luminaire range is supplemented with a wide range of supply systems.



Integration and monitoring

Central monitoring using the LUXMATE LITENET server makes maintenance tasks child's play. Burning life management, lamp failures and the central setting of parameters are carried out quickly and easily. Standard industry interfaces such as OPC and BACnet enable integration into Building Management Systems.



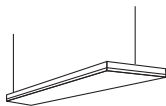
Daylight-based control

The best and most pleasant light is free daylight. With intelligent daylight-based control, no more artificial light is added than is needed for optimal illuminance levels. That saves energy, in fact up to 70 %.



Blinds

Direct sunlight produces glare and uncontrollably heats up the building. Automatic blinds control guarantees glare-free illumination and at the same time reduces requirements for air conditioning.



Control of artificial light

Normally a wide variety of different luminaires and lamp types are used within a building. The comprehensive integration of all components forms the basis for an intelligent lighting solution.



Control

Differing activities and work situations demand differing lighting situations. With modern control units, the intuitive press of a button is all that is needed to adapt the lighting situation in a room.

LUXMATE LITENET – central lighting control with a high level of flexibility

The innovative LUXMATE system admirably fulfills the complex tasks of a central lighting control system. Even difficult tasks such as adjusting the blinds' slat angles in combination with correct dimming levels can be implemented. Another benefit: the lighting control system can be flexibly modified both in scope as well as functionality in accordance with specific customer requirements.

Innovative LED luminaires

Efficient lighting tools with a long service life

LED for functional light The main argument for the use of functional LED luminaires in corridors and entrance areas is their low power consumption combined with a long service life. Maintenance effort equates to almost nothing as the service life of the Zumtobel luminaires achieves 50,000 hours. In terms of quality, the energy efficient LED luminaires provide numerous benefits: with variable colour temperatures they can simulate daylight perfectly. The sealed and therefore low maintenance CAREENA even qualifies it's self for the lighting of classrooms with its good colour rendering properties and outstanding glare control.



CAREENA
Surface-mounted and
recessed LED luminaire



PANOS PureWhite
LED downlight



PANOS BioMotion
LED downlight



CRAYON
LED downlight



2LIGHT Mini LED
LED downlight

Emotional light In the peripheral areas of classrooms and lounge areas, LED downlights and spots are able to create pleasant atmospheres as accent lighting. The modification of colour temperatures and light colours supports people's sense of wellbeing and their emotions in the room. LED spotlights and decorative LED luminaires can also be used for accentuation in corridors and for design purposes within the architectural framework.



2LIGHT Mini LED
LED downlight



VIVO LED
LED spotlight



KAVA LED
Recessed LED luminaire



LEDOS
LED downlight



Surveys, further information and standards

Balanced Light

Susanne Fleischer, ETH Zurich / CH

Dynamic light affects people's sense of wellbeing, motivation and performance

This survey evaluates how and to what degree daylight and artificial light influence our moods and the circadian rhythm. As a part of the survey, Susanne Fleischer investigates the effects of lighting levels, light colours and light directions. Her conclusion: lighting solutions including dynamic changes of artificial lighting adapted to the course of the day, have more positive effects upon the motivation and performance of people than static lighting solutions.

Colour Temperature and Biorhythm

Lighting Research Center,
Brown University, New York / USA

Cool-white colour temperatures influence people's biological rhythm

Photosensitive receptors (ganglion cells) on the retina react most sensitively to bluish light in the low wavelength spectrum and control hormonal processes. Bluish light during daytime promotes the production of serotonin and creates greater alertness and activity. Production of serotonin in the evening, on the other hand, is suppressed by bluish light. In this way the circadian rhythm is controlled. In addition to the choice of illuminance levels, colour temperature plays an important role: similar to daylight during the day, warm white in the evening.

Energy Efficiency with Use of Daylight

Research project on the occasion of the general refurbishment of the school in Sonthofen / D

Intelligent combination of daylight and artificial light

In order to limit energy requirements according to normative specifications, a well functioning overall concept with the integration of daylight is an absolute must. Within the framework of a research project, all time segments for the school were defined in detail for the complete yearly cycle, with specification of available daylight and required supplementary lighting. The results of the highly precise lighting design speak for themselves: with appropriate dimming of the luminaire rows, up to 53 % in energy is saved compared to the previously installed lighting solution. This means that the actual effective energy is significantly below the normative estimate.

Excerpt from EN 12464-1

Reference value for energy consumption of the lighting according to European **standard EN 15193**
 LENI = 24.8 kWh/m²a (educational establishment)

Reference value for energy consumption of the lighting according to Austrian **standard H 5059**
 LENI = 24.8 kWh/m²a (educational establishment)

Reference value for energy consumption of the lighting according to **DIN 18599**
 LENI = 8.49 kWh/m²a (classroom)

Reference value for energy consumption of the lighting according to **Minergy**
 LENI = 8.81 kWh/m²a (classroom)

Useful websites

The portal for light, lamps and luminaires
www.licht.de

The aim of the Right Light Consortium research is a paradigm shift in the sector of conventional lighting specifications and installations towards ergonomic lighting design.
www.lightright.org

Partnerships for Schools (PfS) is responsible for delivering the government's secondary school renewal programme, Building Schools for the Future (BSF).
partnershipsforschools.org.uk

The Commission for Architecture and the Built Environment (CABE)
cabe.org.uk

Teachernet has been developed by the Department for Children, Schools and Families as a resource to support the education profession.
teachernet.gov.uk

The department for Children, Schools and Families
dcsf.gov.uk

The Building Research Establishment Environment Assessment Method, a widely respected method of assessing the green credentials of a building.
brebam.org

The Carbon Trust, a government-funded independent company that helps businesses and the public sector to cut carbon emissions.
carbontrust.co.uk

British Council for Offices (BCO) a useful source of research and guidance specifically aimed at offices, but also of value to those involved in lighting and daylight design for education.
bco.org.uk

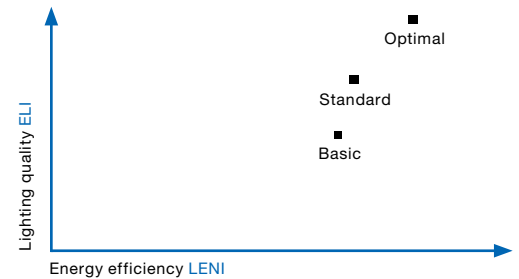
	UGR	Ra	Em	g ₁
Classroom	19	80	300 lx room 500 lx blackboard	0,5 0,7
Classroom for adult classes	19	80	500 lx room 500 lx blackboard	0,5 0,7
Special-subject classrooms: laboratories, productive work rooms, training workshops	19	80	500 lx	
Special-subject classrooms: drawing classes, technical drawing	16	80	750 lx	
Special-subject classrooms: computer rooms Requirements for a DSE workstation	19	80	300 lx	
Lecture hall	19	80	500 lx	
Foyer	22	80	200 lx	
Corridor	25	80	100 lx	
Lounge area	22	80	200 lx	
Staff room	19	80	300 lx	
Library	22	80	200 lx book shelves 500 lx reading area	
Sports hall (see EN 12193)	22	80	300 lx	
Refectory	22	80	200 lx	

Em Maintenance value of illuminance
UGR UGR limit value (glare limitation)
Ra Colour rendition index
g₁ Uniformity

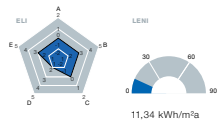
Human Aspects + Energy Efficiency = Humanenergy Balance

Lighting solutions for the classroom in balance

Light for Education and Science is an intelligent combination of energy efficiency and lighting quality. Light that creates optimum learning conditions while saving resources. Daylight plays a major role in this context: it enhances people's motivation and sense of wellbeing, while helping to save energy.



Classroom **Basic**



- TECTON continuous-row lighting system for general lighting (2/49 W)
- TECTON wallwasher for blackboard lighting (1/80 W)
- DIMLITE School Kit with 4 channels

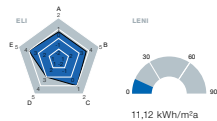
Lighting quality

- All normative requirements for the lighting are optimally met
- General and blackboard lighting have a uniform design

Energy efficiency

- Daylight is used via a simple lighting control system for saving energy
- Lighting scenes are available at the press of a button, and scene management reduces light wastage

Classroom **Standard**



- General lighting with MELLOW LIGHT IV (1/55 W)
- Surface-mounted MIRAL wallwasher for blackboard lighting (1/80 W)
- DIMLITE School Kit with 4 channels

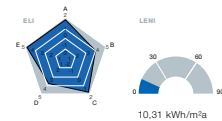
Lighting quality

- The lighting chamber principle creates pleasant light distribution and avoids cave effects
- The high quality lighting solution allows flexible room layouts
- Natural light similar to daylight heightens acceptance of the lighting solution with teachers and pupils

Energy efficiency

- Manually dimmable luminaires can be adapted according to specific activities and also reduce energy consumption
- Control based on daylight and the presence of people additionally increases energy efficiency

Classroom **Optimal**



- Direct/indirect lighting with ECOOS (1/35 W) waveguide/micropismatic luminaire
- MIRAL wallwasher for blackboard lighting (1/80 W)
- DIMLITE School Kit with 4 channels

Lighting quality

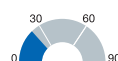
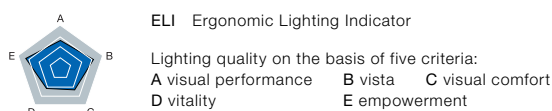
- Thanks to MPO technology the light is perfectly glare-free
- Indirect light components brighten up the ceilings
- High degree of flexibility: work can be carried out at any position in the room
- Modern, with pronounced design orientation
- Control modules are simply and intuitively operated

Energy efficiency

- Excellent performance with a 90 percent light output ratio of the direct/indirect luminaire
- Daylight, presence and scene-based management help the lighting solution to achieve its maximum energy saving potential

General conditions:

7.20 m x 8.40 m classroom, 6 hours on 250 days in the year



LENI Lighting Energy Numeric Indicator

Energy consumption in kWh per year and square metre, based on EN 15193.



INDUSTRY AND ENGINEERING



SPORT AND LEISURE



TRANSIT AREAS AND PARKING



OFFICES AND COMMUNICATION



PRESENTATION AND RETAIL



HOTEL AND WELLNESS



ART AND CULTURE



HEALTH AND CARE



Zumtobel is the internationally leading supplier of integral lighting solutions for a wide variety of applications in professional interior lighting:

Industry and Engineering
Offices and Communication
Education and Science
Presentation and Retail
Hotel and Wellness
Art and Culture
Health and Care
Sport and Leisure
Transit Areas and Parking
Orientation and Safety

We provide unique customer benefit by integrating technology, design, emotion and energy efficiency. Under the Humanergy Balance concept, we combine the best possible ergonomic lighting quality for people's wellbeing with the responsible use of energy resources.

The company's own sales organisations in twenty countries, as well as, commercial agencies in fifty other countries, form an international network of experts and design partners providing professional lighting consulting, design assistance and comprehensive services.

Corporate goal: We want to use light to create worlds of experience, make work easier, improve communications and safety while remaining fully aware of our responsibility to the environment.

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