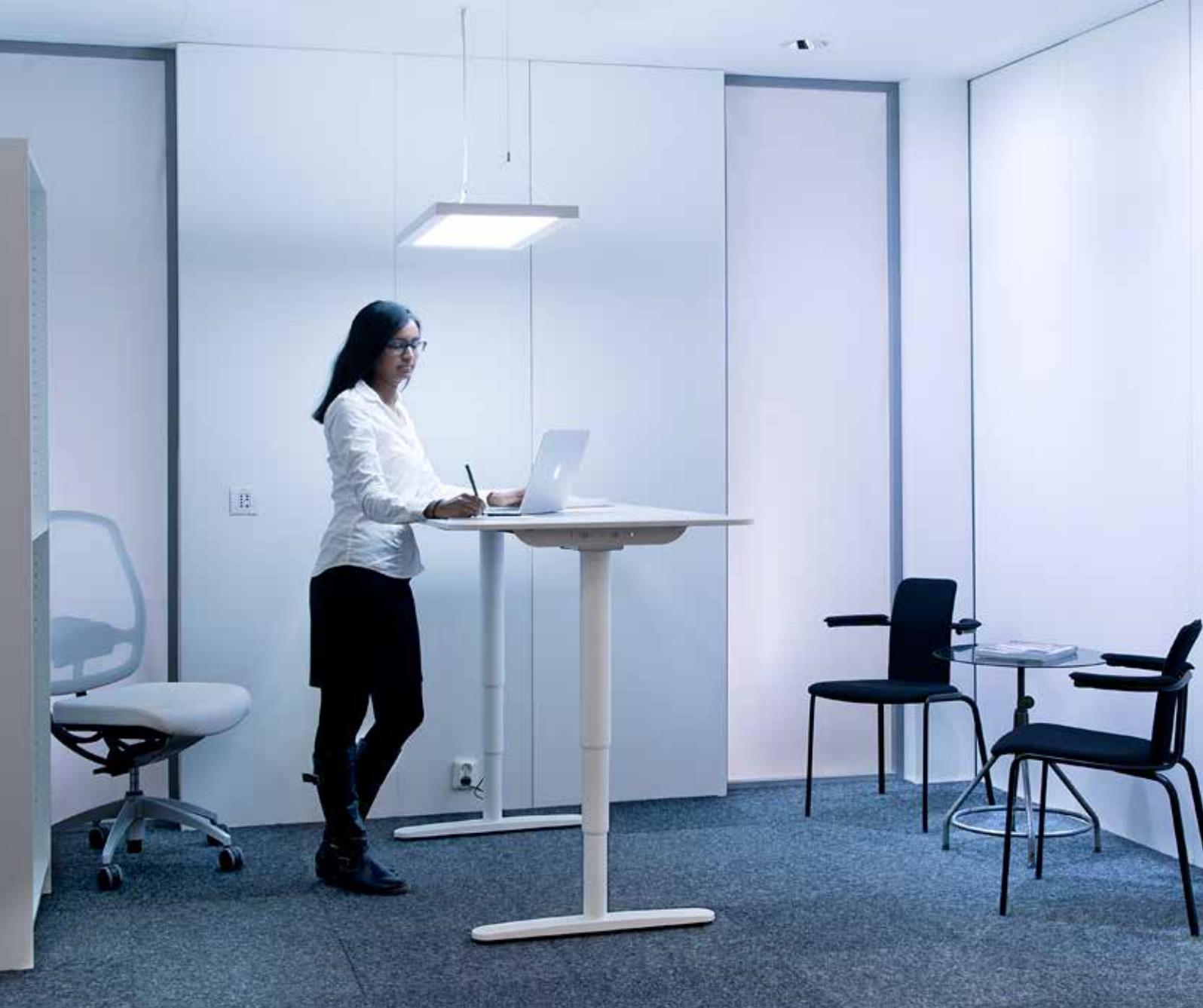


**PERSONAL LIGHT**

*– dynamic lighting for activity and well-being*

**FAGERHULT**



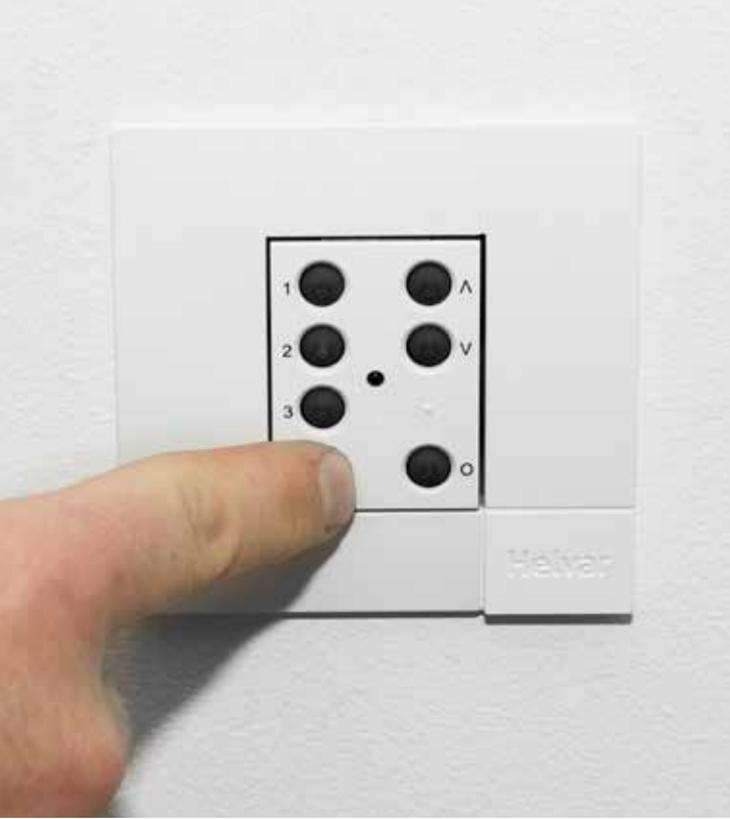
## Think, read, create, rest. Pick your own light!

The height of our chairs, the size of the screen text and the volume on our phones, we are increasing accustomed to being able to adjust and select our preferred settings in our working lives. It's only really the lighting which we don't adapt to our personal preference – and that's about to change.

While it is often possible to set or change the intensity of the light, the colour temperature is dictated by someone else. Our preference for colour temperature isn't static, sometimes we want a cold, activating light, others a warm relaxing one. In a hospital waiting room or a dentist

surgery, for instance, a colder light level may not create the peaceful ambience we crave.

Our preferences for light can also differ with age; the young are inclined towards a colder light while as we get older this changes to warm. Tunable White is a new technology which permits the user to alter the colour temperature to what we prefer within the same luminaire. In an open plan office it is hard to get a very personal lit experience but changing the colour temperature control can still enhance the ambience of the space. Other areas such as lobbies, receptions, conference room, cellular offices and waiting rooms are ideal environments for a tunable white solution.



## From the small to the large – the technique is simple

Technically, it's not that complicated. Everything is controlled with a DALI Device Type 8 and can be implemented with different types of control units depending on what you want to achieve. If you want to imitate daylight in colour and intensity automatically, use a router system, otherwise it is often enough with a generic control panel, simple button panels or touch panels to control manually.





## Better light in the conference room

Conference rooms are often located in the middle of the building without access to daylight. It is an area where the colour temperature control can be used in several ways.

A cooler light when more active tasks are being performed, or a warmer light when we need to focus. A common issue when using video conferences is that camera is unable to handle the light levels as well as the human eye, so we are perceived as looking more sickly. With a Tunable White solution, we can adapt the light level so that the faces of the participants are rendered as realistically as possible, helping to facilitate the communication process. In this application, Pleiad Wallwashers are used to vary the light on the walls to get exactly the right light for every task.





## All light on me – the auditorium

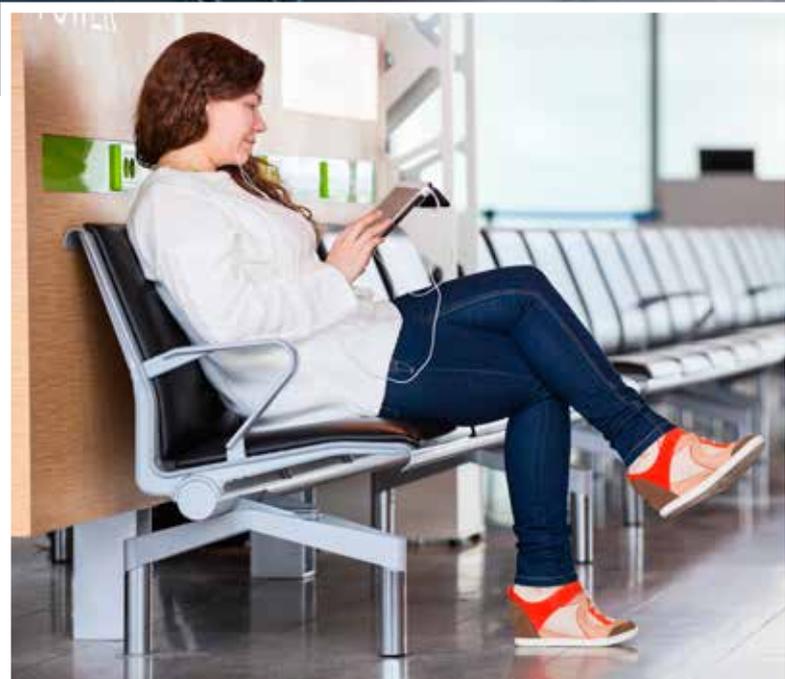
Education or full-day conference? As well as having scenes with different lighting levels, it is advisable to also control the colour temperature. By using a timing control the colour of the light provides the participants with an idea of the time of day. Alternatively, we can use the colour temperature to create different scenes. Refreshing high levels of cold light for activity or warmer dimmed light for focus and concentration. The light on the presenting area is controlled separately depending on what activities are going on there.



## Welcoming in the entrance or waiting room

In the entrance or the waiting room light is controlled with a router solution to imitate daylight, both in intensity and colour. This can be especially important if there is no natural daylight reaching in the room. This solution provides a sense of having access to daylight, even if the room is located in the middle of the building where there is limited access to the real thing. Pozzo creates a feeling of natural light wells, reinforced by adding light on the walls with Pleiad Wallwasher G3.







## Personal light in the cellular office

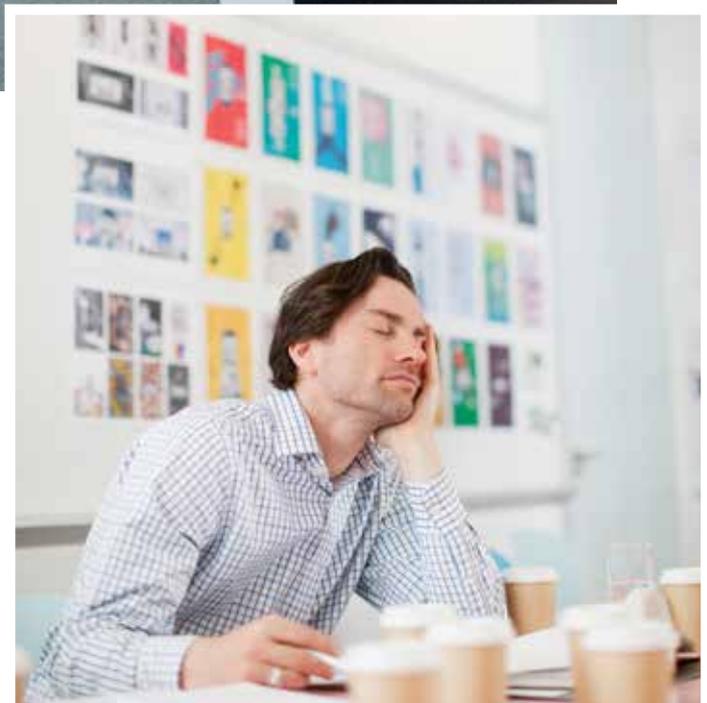
A cellular office is the easiest room to apply a Tunable White solution as there is only one user who controls the light according to his or her preferences. Think of a cold, intense light when you want to activate yourself or a warm dimmed light for conversations, reading and tasks which require concentration. Using a suspended direct/indirect Combilume, supplemented with Pleiad Wallwasher G3, provides the ambient and task light requirements, with the colour temperature and intensity controlled via a simple panel on the wall.





## Activity or rest in the pause room

In breakout rooms the benefits of colour temperature control are in their element, transforming how you can use the space. A pause in the cold light revitalises us while a warmer light calms us down. In this example we have chosen recessed Pozzo. The large, wide beam distribution creates a light-well effect, giving an impression of natural light, further optimised with a varying colour temperature which imitates the evolution of daylight throughout the day. Because the ones who pauses also want control a simple panel on the wall can be used to define a specific light setting.



## Dynamic in the open plan office

Open plan offices cannot be controlled to reflect each individual's personal preferences since the room is lit for a group of people. Here we recommend a router solution that varies the light over time and adjusts the colour temperature mimicking the light outdoors. In the ceiling we have Multilume Flat and, to strengthen the sense of a natural daylight, the walls are lit using Pleiad Wallwasher G3.





# How does it work technically?

The LED modules contains a mixture of diodes providing warm or cold light. By mixing the light from these we can get colour temperatures between 2700–6500 kelvin out of a single luminaire. Everything is controlled via DALI Device Type 8 and can be managed with different types of control units depending on what you want. The simpler panels have buttons or levers where the colour temperature is controlled with a slider and the intensity with another.

For an automatic dynamic control of colour and intensity a router system that dictates the levels over time is used. The colour temperature and intensity is controlled by the clock and doesn't reflect the actual lighting conditions outdoors as it would be very dark in the room during the winter months.



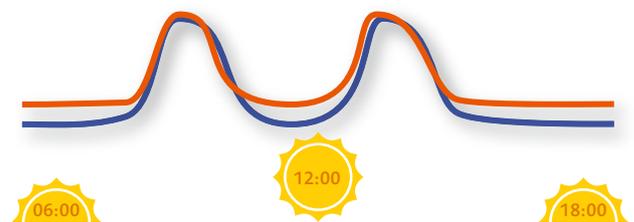
## Light over the day

Especially during the dark months we can stimulate the circadian rhythm with light, using lower levels of warm light in the morning increasing to higher levels with cooler light until noon and then slowly return to lower levels and warm light in the afternoon.



## Activating light showers

To activate and promote concentration, we can “shower” in high levels of cold light for short periods throughout the day. Studies in school environments have shown positive changes in activity. Perhaps this could be applied as activating light boost after lunch when the body's systems are fully occupied to digest food!



## Other applications for colour temperature control?

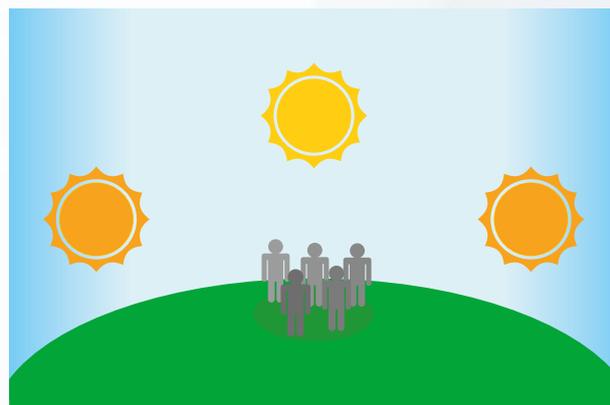
Virtually any room with no access to daylight or variable and specific lighting requirements. Within healthcare applications areas such as, corridors, patient rooms, radiation departments, recovery can all be optimised with a tunable white solution.



## Is it good for humans?

Up until now, our understanding has outstripped the technical capabilities, with various research projects being conducted within this field. The fact that blue light activates and warm light calms, is increasingly substantiated, it is all about imitating the natural light and its variation that has controlled our biological clock since the origin of life. With dynamic light we can see that the biological clock keeps time, especially during the dark months, or in rooms with limited access to natural light.

The biological clock, also called the circadian rhythm (from the Latin *circa dies*, “about a day”) and plays an important role in regulating wakefulness and sleep. If we can help that clock, we can help people feel better. By designing good lighting systems, lighting can help increase concentration and motivation and to improve subjective and objective well-being.



The ideal is simply to imitate natural light, both in level and colour during the day. Cold, intense light with a high blue is activating, warm dimmed light is relaxing.

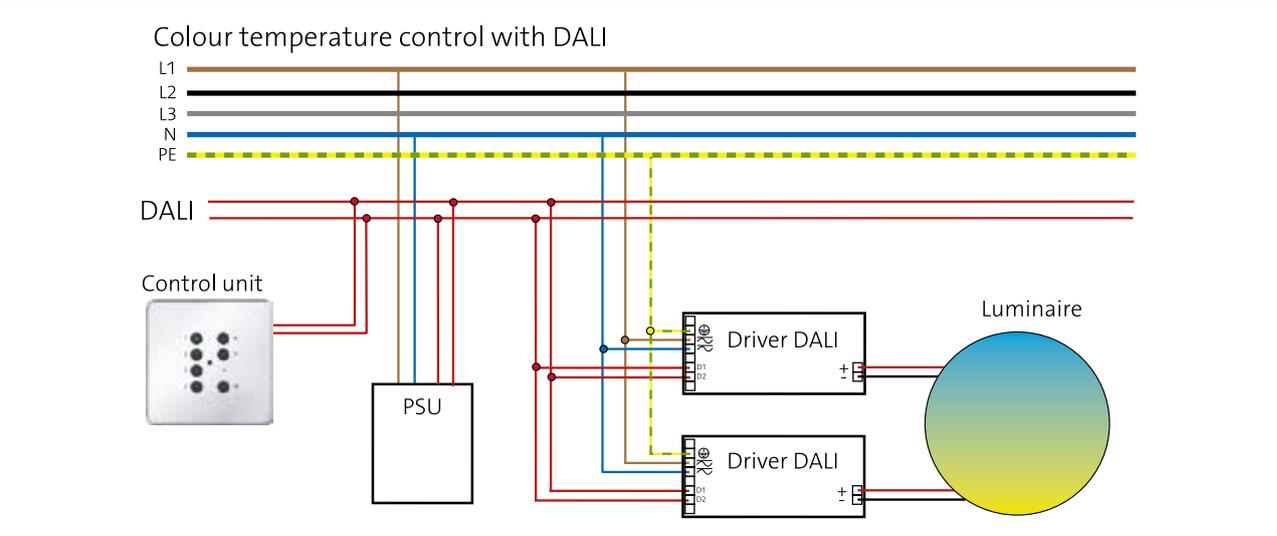
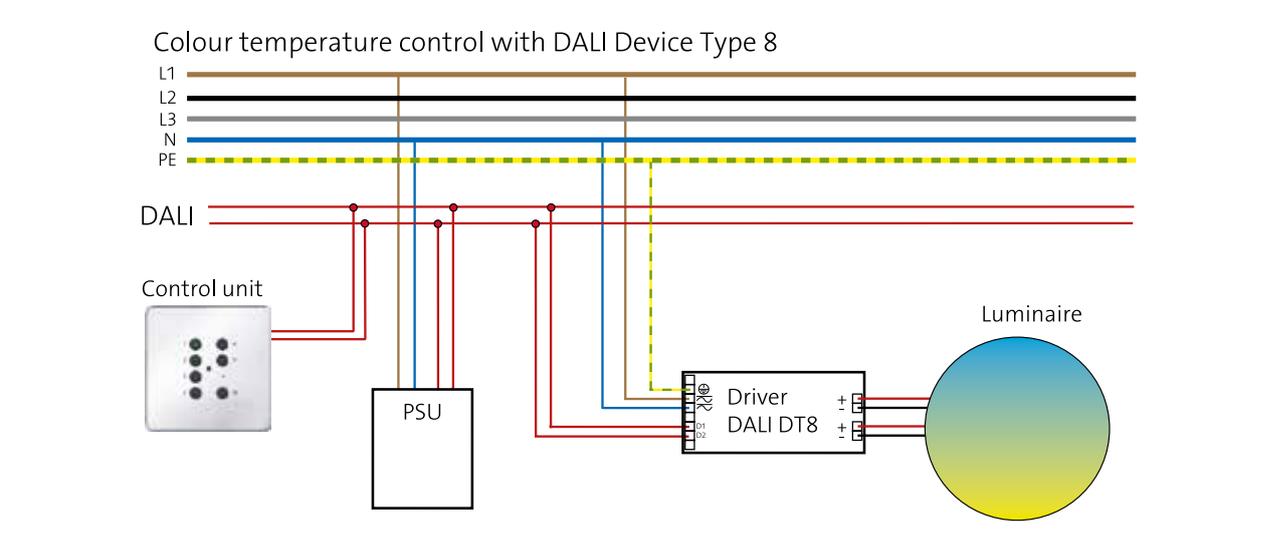
You can read more about this at [lightingforpeople.eu](http://lightingforpeople.eu) or at [humancentriclighting.com](http://humancentriclighting.com).

# DALI Device Type 8

DALI ballasts that are compatible with DALI Device Type 8 provide functionality for controlling colour temperature. DALI ballasts that are compatible with DALI Device Type 8 are controlled with only one DALI address that controls both the cold and the hot diodes.

The function with different colour temperatures requires no programming with respect to the mixture of cold and warm light since the logic is built into the devices. The desired colour temperatures for different scenes are set directly in programming.

Conversely, when using DALI ballast which do not communicate according to DALI extension 209 (as opposed to the Type 8 described above), two ballasts are required: one for the warm and one for the cold diodes. To achieve the varying colour temperatures, each level (i.e. 3000 K, 4000 K, 5000 K) has to be both measured with a spectrometer and individually programmed.



# Combilume



In Combilume, LED technology is really in its element. The modern light technology and side-emitting light diodes result in pleasant, even surfaces both for individual office work stations and for large rooms where people come together. Equipped with Tunable White Combilume becomes the creative lighting for the whole project with possibility to set the colour temperatures from 2700 K to 6500 K.

## Luminaire

System, W	Module	Colour temp., K	Luminous flux, lm	Efficiency, lm/W	kg	White	Alu-grey
63	300×800	4000 (2700–6500)	4975 (4449–5217)	80 (71–83)	4.0	11950	11951

Values for luminous flux and efficiency are listed as 4000 K – the range is shown in the brackets. For current information on output and luminous flux, please refer to our website.

## Information LED

Colour temp. (CCT)	Ra (CRI)	Life	Colour quality
2700–6500 K	≥ 80	$L_{50}$ 50.000 h	MacAdam 3 SDCM

For current information on output and luminous flux, please refer to our website.



# Pleiad Wallwasher G3



A wallwasher has its place in offices, lobbies and other public spaces. Pleiad Wallwasher G3 harmonises with the other luminaires in the room, and, when equipped with Tunable White, it also provides an opportunity to create a more dynamic lighting with different colour temperatures.

## Luminaire

System, W	Colour temp., K	Luminous flux, lm	Efficiency, lm/W	kg	Reflector	
26	4000 (2700–6500)	1510 (1490–1460)	58 (60–54)	1.6	Specular	<b>77994</b>

Values for luminous flux and efficiency are listed as 4000 K – the range is shown in the brackets. For current information on output and luminous flux, please refer to our website.

## Information LED

Colour temp. (CCT)	Ra (CRI)	Life	Colour quality
2700–6500 K	≥ 80	L <sub>70</sub> 50.000 h	MacAdam 3 SDCM

For current information on output and luminous flux, please refer to our website.



# Pleiad Comfort G3



Thanks to an innovative Anti-Glare Control ring, Pleiad G3 harnesses the efficiency of the LED lightsource without compromising on the ergonomics. Further enhanced with Tunable White, they create bright and flexible environments where people thrive to reside and work.

## Luminaire

System, W	Colour temp., K	Luminous flux, lm	Efficiency, lm/W	kg	Reflector	
27	4000 (2700–6500)	1226 (1230–1175)	45 (47–42)	1.5	Specular	<b>77975</b>
27	4000 (2700–6500)	1276 (1260–1205)	47 (49–43)	1.5	Matt	<b>77976</b>

Values for luminous flux and efficiency are listed as 4000 K – the range is shown in the brackets. For current information on output and luminous flux, please refer to our website.

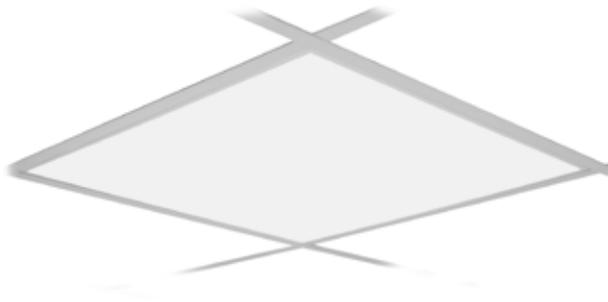
## Information LED

Colour temp. (CCT)	Ra (CRI)	Life	Colour quality
2700–6500 K	≥ 80	L <sub>70</sub> 50.000 h	MacAdam 3 SDCM

For current information on output and luminous flux, please refer to our website.



# Multilume Flat Delta



Multilume Flat has a completely level smooth surface which follows the surface of the ceiling, resulting in a stylish and discrete appearance. Multilume Flat's balanced work and general lighting delivers excellent light comfort, constantly updated with the latest LED technology. Light-ing control and Tunable White makes a sustainable and flexible office lighting.

Luminaire				
System, W	Module	Colour temp., K	Luminous flux, lm	Efficiency, lm/W
55	600 × 600	4000 (2700–6500)	4238 (3785–4398)	77 (69–80)
				<b>23802</b>

*Values for luminous flux and efficiency are listed as 4000 K – the range is shown in the brackets. For current information on output and luminous flux, please refer to our website.*

Information LED			
Colour temp. (CCT)	Ra (CRI)	Life	Colour quality
2700–6500 K	≥ 80	L <sub>70</sub> 50.000 h	MacAdam 3 SDCM

*For current information on output and luminous flux, please refer to our website.*



# Pozzo Delta



Pozzo is like a little piece of the sky, a light well in the room where it is not possible to get the real thing. Inspired by the natural light Pozzo gives a pleasant natural light feeling. Pozzo with Tunable White provides a further opportunity to create the feeling of natural circadian rhythm when the colour temperature can be regulated as the day passes.

## Luminaire

System, W	Ø	Colour temp., K	Luminous flux, lm	Efficiency, lm/W	
35	450	4000 (2700–6500)	2650 (2386–2756)	76 (68–79)	<b>24842</b>
46	550	4000 (2700–6500)	3573 (3181–3681)	78 (69–80)	<b>24843</b>

Values for luminous flux and efficiency are listed as 4000 K – the range is shown in the brackets. For current information on output and luminous flux, please refer to our website.

## Information LED

Colour temp. (CCT)	Ra (CRI)	Life	Colour quality
2700–6500 K	≥ 80	L <sub>70</sub> 50.000 h	MacAdam 3 SDCM

For current information on output and luminous flux, please refer to our website.



Fagerhult develops, manufactures and markets professional lighting systems for public environments. Our operations are run with a constant focus on design, function, flexibility and energy saving solutions.

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