

PHILIPS

Melanopic lighting

BioUp technology



Increase wellbeing
in the workplace by
applying melanopic
lighting

The importance of light on performance

We have become the indoor generation. On average, we spend more than **90% of our time indoors**, with **36% of that spent in the workplace**. But the more time we spend indoors, the less we're exposed to **the beneficial effects of light**. As a consequence, we don't receive enough nutrition from natural daylight to help us:



See better



Feel better



Function better

Light has a visual impact (see better), an emotional impact (feel better) and a biological impact (function better).

Although the **biological effects of light determine our general wellbeing**, indoor lux levels are generally tuned to the **visual functions of light (500lux)**. And it is below recommended levels regarding biological impact.

To feel well, it's important to sleep well. To be able to sleep well, you need daylight to synchronize your circadian rhythm. Daylight will help you to sync your sleep-awake-cycle. Our innovation brings natural daylight indoors, aligning your sleep-wake cycle for ultimate well-being. Say goodbye to indoor lifestyle challenges with our technology.

No more biological darkness!



Mentally and emotionally-committed employees are likely to be top performers who **miss 20% fewer workdays**¹



Organizations with a high engagement levels report **20% higher productivity**²



High melanopic light levels benefit office worker's **wellbeing**, and therefore the **strength of your organization**.

People who appraise their lighting as 'good' will also appraise the room as more attractive, be in a more pleasant mood, be more satisfied with the work environment, and more engaged in their work.³



Philips BioUp for WELL lit buildings

Our technology not only elevates well-being but also propels building towards higher score of WELL Building Standard. A brighter, healthier future awaits with BioUP.

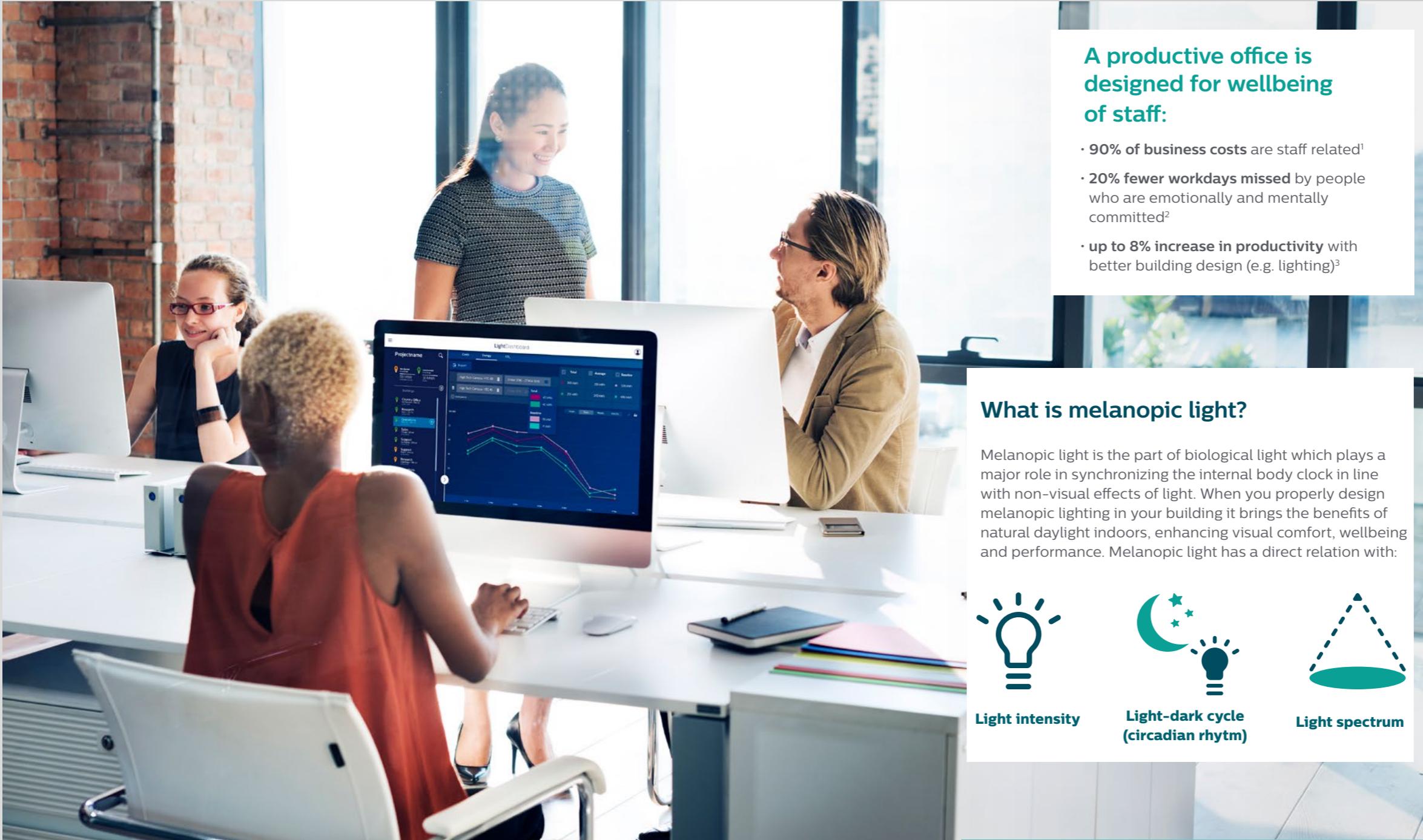
To find out more, contact your Signify representative.

<https://www.lighting.philips.co.uk/oem-emea/support/technical-downloads>

¹ Extract from: Miller 2003

² Extract from Harvard Business Review 2013 by the Gallup Organization

³ Extract from: "Linking Lighting Appraisals to Work Behaviors" Jennifer A. Veitch, Mariska G. M. Stokkermans and Guy R. Newsham Environment and Behavior 2013 45: 198 originally published online 16 September 2011.



Lighting and the WELL Building standard™

A WELL certificate offers an opportunity to increase the value of real estate through the technical requirements that indicate to what extent a building is designed for health and wellbeing of staff. Functional environments are giving way to spaces that:

- engage and inspire
- improve mood, supports a sound rest and performance
- attract talent and retain high-value employees

A productive office is designed for wellbeing of staff:

- 90% of business costs are staff related¹
- 20% fewer workdays missed by people who are emotionally and mentally committed
- up to 8% increase in productivity with better building design (e.g. lighting)³

What is melanopic light?

Melanopic light is the part of biological light which plays a major role in synchronizing the internal body clock in line with non-visual effects of light. When you properly design melanopic lighting in your building it brings the benefits of natural daylight indoors, enhancing visual comfort, wellbeing and performance. Melanopic light has a direct relation with:



Light intensity



Light-dark cycle (circadian rhythm)



Light spectrum

About WELL lighting points

In the WELL Building Standard, the concept 'Light' covers nine features, one of which is Circadian Lighting Design (L03). This provides guidelines on ways to minimize disruption to the circadian system, enhance productivity, support relaxation and provide appropriate visual acuity.

Philips solutions will help you maximize the WELL points for Circadian Lighting Design (L03):

1 point: melanopic-EDI 136 lux or 109 lux*

3 points: melanopic-EDI 218 lux or 163 lux*

* Lowest lux value applies when the project also meets L05 Part 1 (daylight design) or L06 Part 1 (daylight simulation).

¹ World Green Building Council. Health, Wellbeing & Productivity in Offices: The next chapter for green building. 2014

² Miller NG, Pogue D, Gough QD, Davis SM (2009) Green buildings and productivity JOSRE 1(1):65-89

³ Guy R. Newsham, Jennifer A. Veitch & Yitian (Vera) Hu (2018) Effect of green building certification on organizational productivity metrics, Building Research & Information.

What is melanopic-EDI?

Melanopic equivalent daylight illuminance (melanopic-EDI), unit lux, is the circadian metric adopted by the International Commission on Illumination (CIE). It describes the response of the non-visual photo-receptors (ipRGCs) in our eyes. This response is indicative for how the body will respond and is a combination of the spectrum of the light and the intensity.

What is melanopic-DER?

The melanopic daylight efficacy ratio is a spectral metric of the biological effect of artificial light source compared to daylight (6500K). The melanopic-DER of a reference daylight spectrum is 1. Typically, artificial lighting has a lower biological effect than daylight, the melanopic-DER being below 1.



Four ways to increase melanopic light levels and achieve WELL points for Circadian Lighting Design (L03)

Option 1 Install more luminaires

- provides more light
- higher installation costs
- higher energy consumption

Option 3 Increase color temperatures with FlexTune modules

- higher color temperatures provide a cooler light
- the more blue in the spectrum, the more biologically active the light (higher melanopic-DER).
- however, not everyone likes cool light
- tunable white solutions allow cooler light mid of day and warmer light in the morning and evening, following the circadian rhythm

Option 2 Use luminaires with a higher light output

- provides more light
- higher energy consumption
- risk of disturbing glare

Fortimo LED Strip BioUP is available with a light output up to 6000lm, while still meeting the glare requirements for offices.

Option 4 Use modules with BioUp technology (CES and CED)

- BioUp is a cyan enhanced spectrum
- cyan light increases biological impact

Using BioUp technology is the most energy and cost efficient way to gain L03 WELL points.

Product Description	CCT	Length
Fortimo LED Strip BioUP CES	4200 K	1/2 Ft
Fortimo LED Strip BioUP CED	2700-5000 K	1/2 Ft

What is BioUp?

Fortimo BioUp technology (CES and CED) enhances the LED spectrum with cyan light. This increases the biological impact of the light. With BioUp the melanopic-DER is significantly higher compared to standard LED spectrum (see table 1). There is no change in visual light output and a range of colors is available (CRI>80, R9>50, CCT 4000K, 2700-5000K).

This graph shows the spectra of standard LED (white line) and the new BioUp (black line). The peak in the cyan wavelength is clearly visible.

Product Description	Melanopic-DER
Fortimo LED Strip 4000K	0.62
Fortimo LED Strip BioUp CES 4200K	0.86
Fortimo LED Strip BioUp CED (at 5000K)	0.95

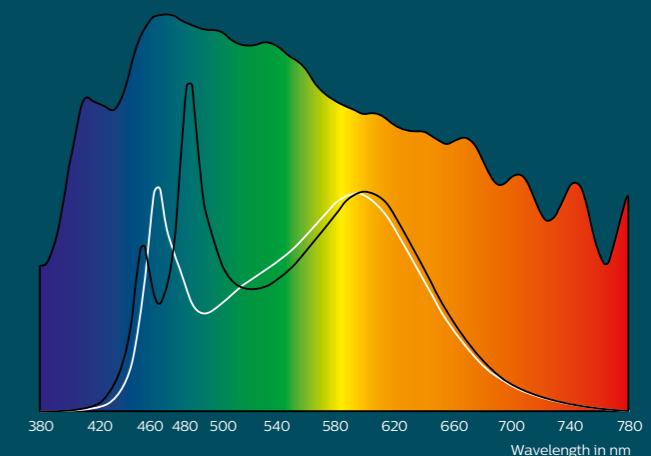


Figure 3: Spectral power distribution of a standard 4000K LED source (white line) and the one in Philips BioUp (black line)

Picture of Option 3

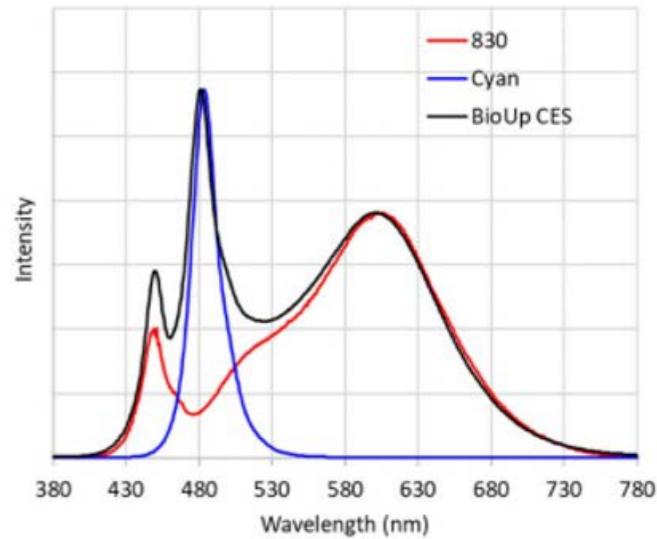


Picture of Option 4



Fortimo LED Strip BioUp

Picture of Option 3





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