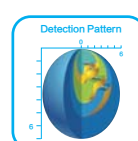


# Human Centric Lighting Circadian Rhythm System

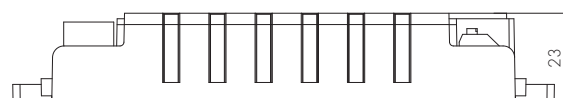
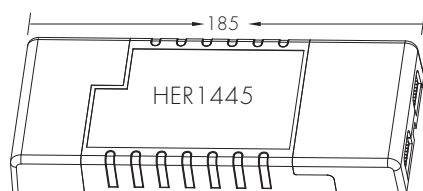
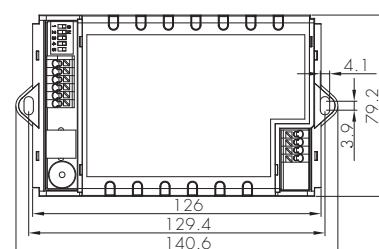
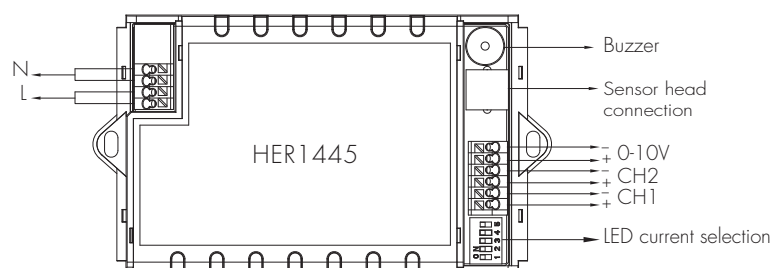
Model: HER1445 + SAM5/DH  
with HRC-09



Lighting can reduce energy bills, it also can boost productivity and promote the wellbeing of humans in artificially lit environments. Different from other complex lighting systems, Hytronik circadian rhythm system offers a simple de-centralized human centric lighting solution for offices, schools and hospitals with the tunable white feature. Comprised of just one driver with a detached sensor head and remote control handset, the system allows great flexibility and high specification in an easy to install and commission package.

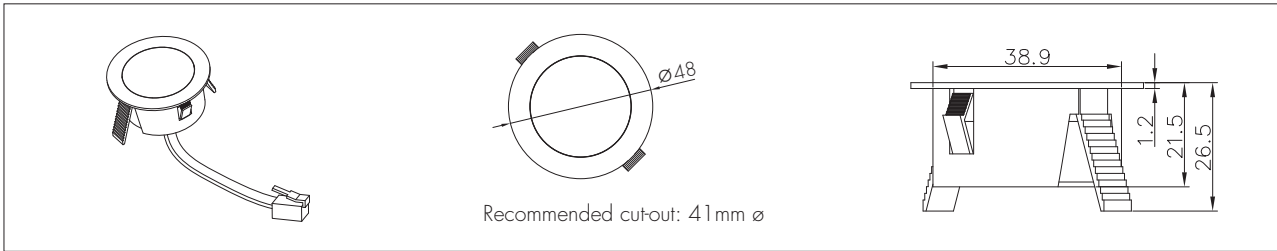
The system is comprised of the following 3 elements:

**a** The driver **HER1445** is the engine behind Hytronik's de-centralized circadian rhythm system. It will automatically control the white balance and dimming level based up on research recommendations. With both built-in and stand-alone installation enclosures available, the driver is perfectly designed for both fixture built-in and external installation.



\* Clever case design for optimal built-in size or insulated terminals for mounting externally to the fixture.

**b** Detached occupancy sensor head / photocell - SAM5/DH performs the function of reading the natural daylight and maintaining the lux level with artificial light as required. As a further energy saving opportunity, the microwave sensor will turn off the light in any unoccupied spaces, and automatically resume the algorithm when the space becomes occupied. It also functions as the receiver unit for the remote control.



**c** By using remote handset HRC-09, the user may manually adjust the regulation of color or brightness of the curves to suit individual comfort requirements. Further adjustments are available to shift the timing of the curve to match the working practice of the environment. Please refer to remote control handset user guide for more details.

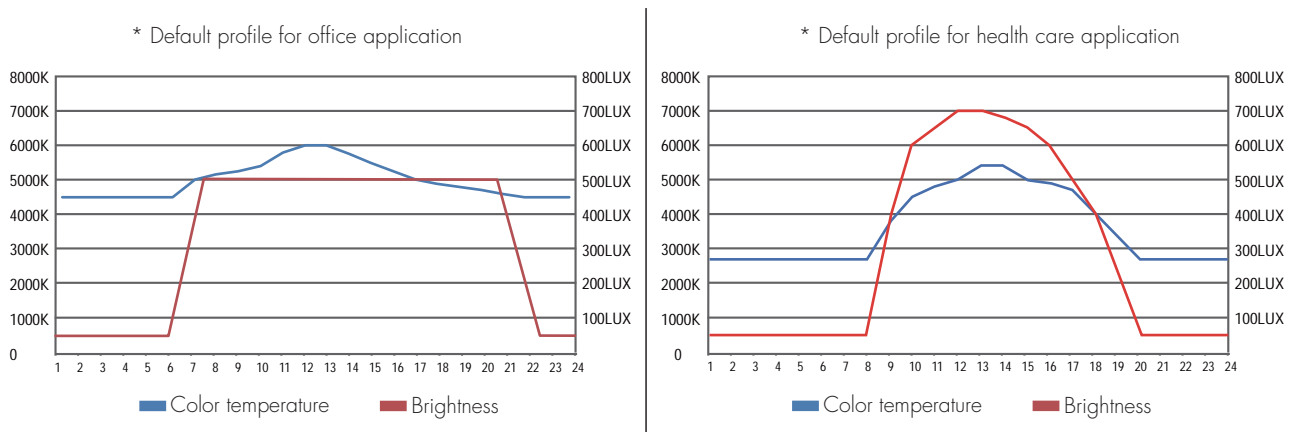
## 45W Tunable White LED Driver

### 1 Circadian Rhythm Lighting

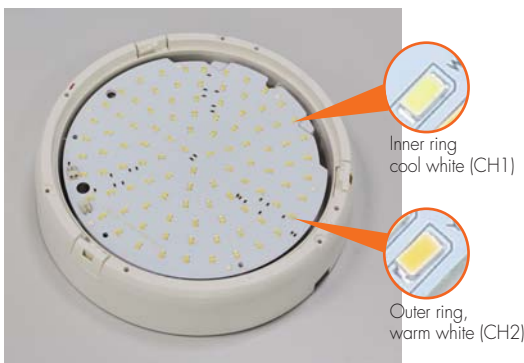
With geographic regional adjustments for latitude and automatic seasonal adjustment, the controlled light output can enhance a user's day to day mood, wellbeing, productivity and attention levels. The user can selected the biodynamic lighting curve with pre-programmed color (CCT) and brightness (LUX) control which automatically change according to the time of the day. A total of 9 profiles are available for selection; 1 for office and 8 for health care purposes.

#### Circadian Rhythm Profiles

\* Default profile controls for Color Control (CCT) and brightness (LUX) Control



### 2 LED Layout



There are two different groups of LEDs on the PCB panel which are connected to the respective channels of the LED driver HER1445. Channel 1 (CH1) is for cool white, whilst channel 2 (CH2) is for warm white.

The power is distributed over the 2 channels as required and each is capable of supporting the full load, which means when channel 1 is at full power 45W (6000K), the output of channel 2 (2700K) is 0W, and vice versa.

#### Application Example:

When channel 1 is 20W and channel 2 is 25W, the mixed light output is still consuming 45W, and the color temperature is around 4000K.

### 3 LED Current Selections

The HER1445 offers a wide range of common constant current selections to suit most LED PCB designs. It is important to select the correct value for correct operation of the luminaire.

Current selection is made using the dipswitches as table on the right:

1200mA	● ● ● ● ●	
1050mA	● ● ● ● ○	
900mA	● ● ● ○ ○	
700mA	● ● ○ ○ ○	
500mA	● ○ ○ ○ ○	
350mA	○ ○ ○ ○ ○	
	1 2 3 4 5	

### Light Brightness and CCT Adjust by 0-10V

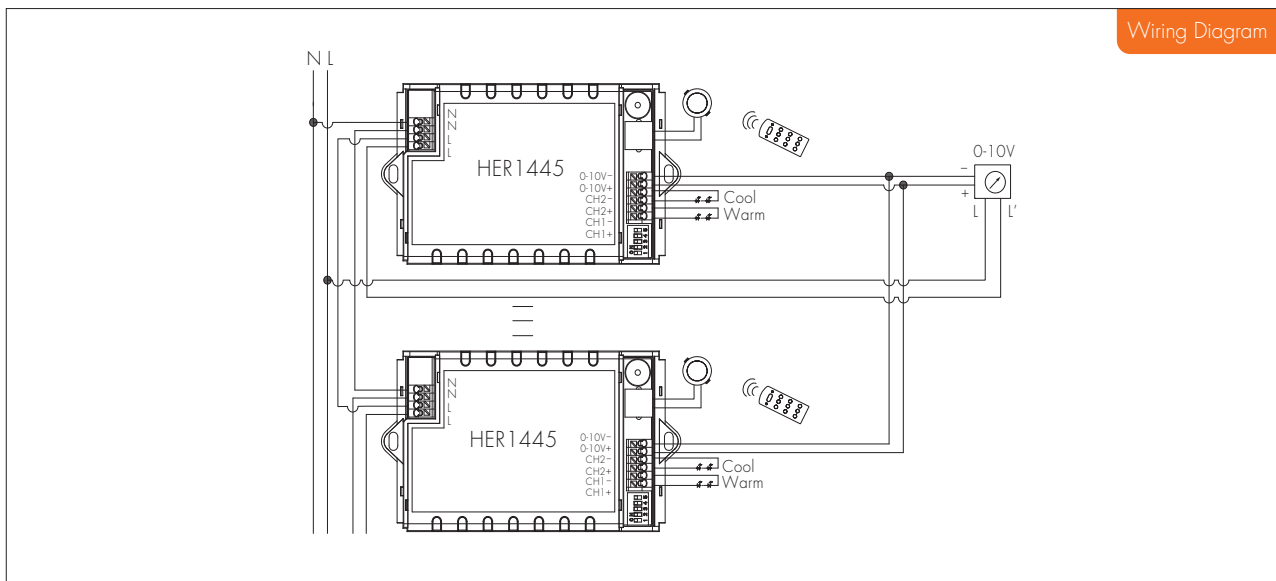
The driver HER1445 has 2 independent output channels to tune the color temperature and adjust light brightness. The color temperature and light brightness. Both are controlled via the 0-10V output.

\* Brightness adjust:

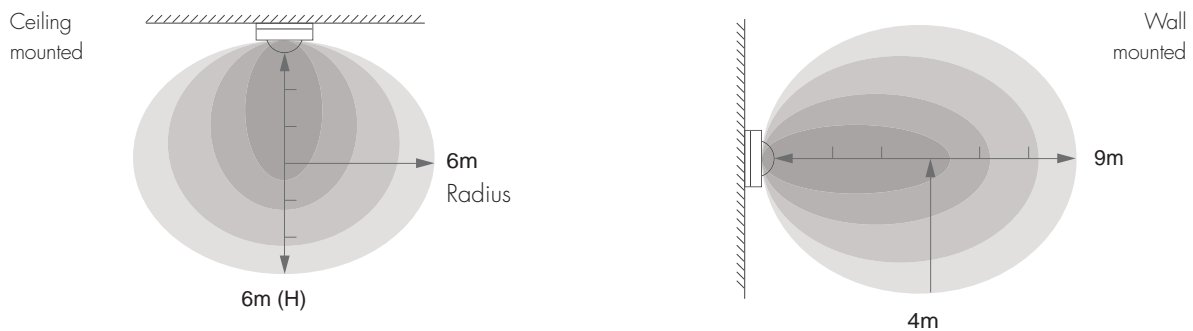
Light brightness can be finely adjusted by rotating the 0-10V dimmer.

\* CCT adjust:

The color temperature starts tuning after cycling off/on the 0-10V dimmer 3 times within 3 seconds. Set the desired color by a further off/on cycle.

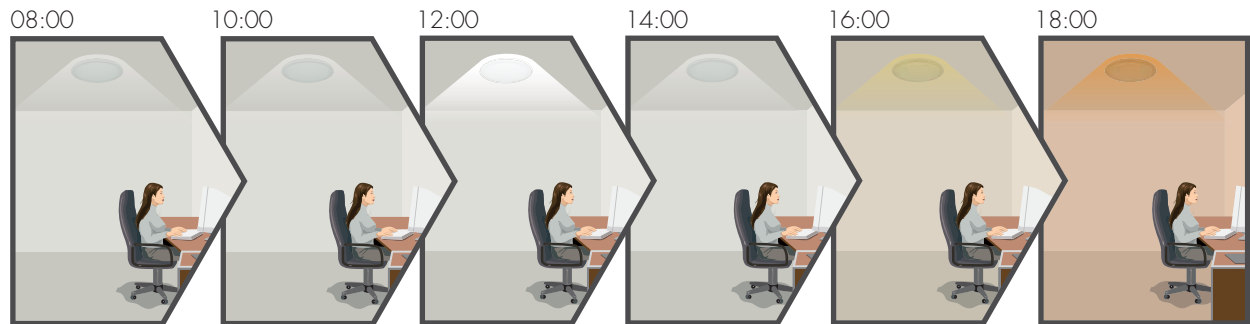


### Detection Pattern

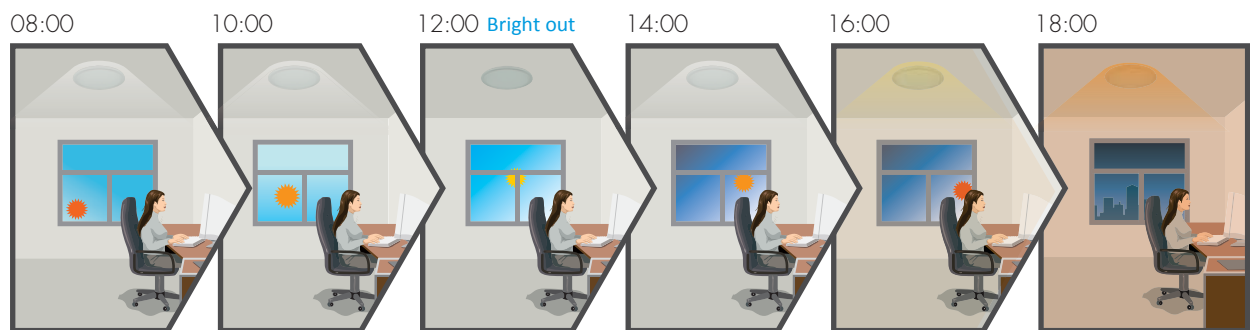


## Office Application

The color temperature is adjusted automatically by the real time clock within the driver HER1445. Occupancy detection and daylight harvest functions are provided by SAM5/DH.

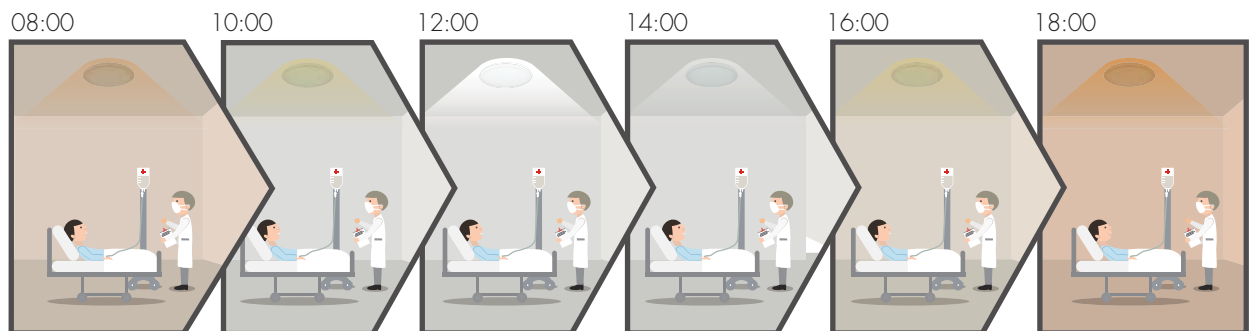


Office with no natural daylight

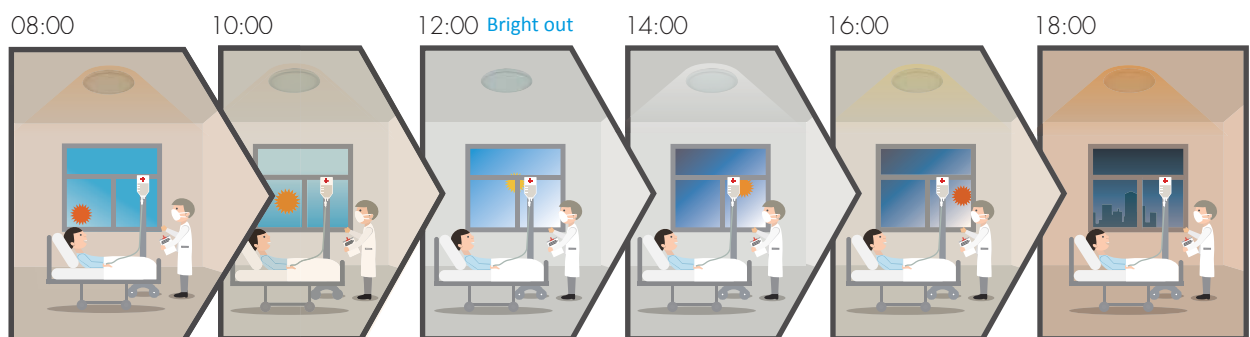


Circadian rhythm with daylight harvest to maintain maximum energy savings.

## Health Care Application



Health Care with no natural daylight



Circadian rhythm with daylight harvest to maintain maximum energy savings.

## Settings (Remote Control HRC-09)

### Clock Circadian Rhythm Set-up

#### 1. Time and Date

Circadian rhythm mode requires the remote control HRC-09 to first be programmed with the time and date. This done by following the procedure below:

Press and hold the "Clock" button until the "Set" LED in the top left corner starts to flash (approximately 2 seconds) to indicate clock setting mode. The settings should be made in the strict following order:

- Enter the 4 figure year using the numbers 0-9: YYYY (e.g. 2016)
- Enter the 2 figure month: MM (e.g. 09 for September)
- Enter the 2 figure date: DD (e.g. 06 for the 6th)
- Enter the 2 figure hour in 24 hour time format : HH (e.g. 08 for 8 am)
- Enter the 2 figures for minutes: mm (e.g. 05)

After the 12 digits have been entered in the correct sequence, press "Clock" button to store the settings. The "send" LED at the top right of the remote will flash 5 times to indicate a valid entry. If the entry was not valid and the 5 send LED flashes are not seen, the procedure will need to be repeated. If a programming mistake is made anytime during the sequence, press "Clock" once to cancel the programming mode and re-start from the beginning of the procedure.

#### 2) Latitude adjustment (Health care mode only)

To allow for regional variations and automatic seasonal adjustment, the latitude of the installation may be set.. The default setting is Latitude 01 (0° Equator).

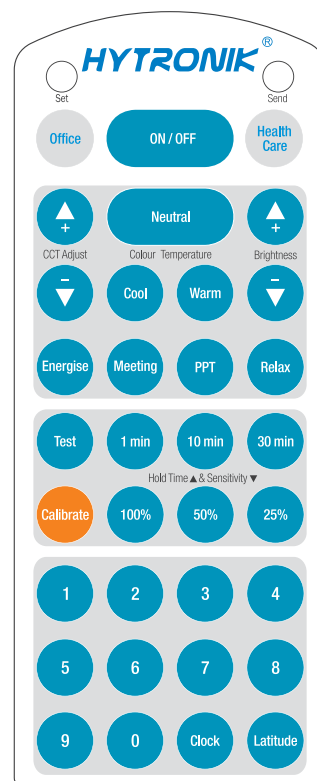
Press and hold the "Latitude" button until the "Set" LED in the top left corner starts to flash (approximately 2 seconds) to indicate city setting mode.

- Enter the 2 figure number as per the table below:

No.	Latitude	Summer Time	Winter Time
01	0° Equator	06:00 ~ 18:00 (12 Hours)	06:30 ~ 18:00 (11.5 Hours)
02	15° North	06:00 ~ 18:30 (12.5 Hours)	08:00 ~ 18:30 (10.5 Hours)
03	30° North	06:30 ~ 19:30 (13 Hours)	08:00 ~ 18:00 (10 Hours)
04	45° North	06:00 ~ 19:30 (13.5 Hours)	08:00 ~ 17:30 (9.5 Hours)
05	60° North	05:30 ~ 19:30 (14 Hours)	08:00 ~ 17:00 (9 Hours)
06	15° South	07:00 ~ 19:30 (12.5 Hours)	08:00 ~ 18:30 (10.5 Hours)
07	30° South	06:30 ~ 19:30 (13 Hours)	08:00 ~ 18:00 (10 Hours)
08	45° South	06:00 ~ 19:30 (13.5 Hours)	08:00 ~ 17:30 (9.5 Hours)

Press "Latitude" button to store the setting. The "send" LED at the top right of the remote will flash 5 times to indicate a valid entry. If the entry was not valid and the 5 send LED flashes are not seen, the procedure will need to be repeated.

The remote is now programmed and should be handed to the responsible person of the installation when commissioning is completed.



### Calibrate Circadian Rhythm LED Driver (HER1445) Calibration

Each HER1445 on the installation now needs to upload the time and date also latitude settings from the remote control handset HRC-09. This is simply performed by pressing the calibrate "Calibrate" button at each SAM5/DH receiver point. The remote control is directional and confirmation of the upload is given by an audible beep.

Note! If the supply to the HER1445 is interrupted, it will need to be re-calibrated via the remote control handset as per the above procedure.

ON / OFF

Test

1 min

10 min

30 min

100%

50%

25%

## Sensor Settings

SAM5/DH includes a HF occupancy sensor, which can be set for hold time (the time period the lights are required to be on after the last person has left the room) and detection range. This time period may be adjusted by selecting any one of the "1 min", "10 min", "30 min" buttons as required.

Please note microwave occupancy detectors can 'see' through glass, plastic and plasterboard, so attention must be given to the correct settings of the sensitivity to avoid nuisance triggering. To assist with commissioning, a 2 second test mode has been provided to avoid unnecessary waiting time. This mode is accessed by pressing the "Test" button. The sensitivity is then adjusted by using the "100%", "50%", "25%" buttons.

The lights may be turned off manually at any time by pressing the "ON / OFF" button. Please note the occupancy detector is disabled when the off button is pressed. Pressing the "ON / OFF" button again will resume fully automatic operation with the occupancy sensor enabled.

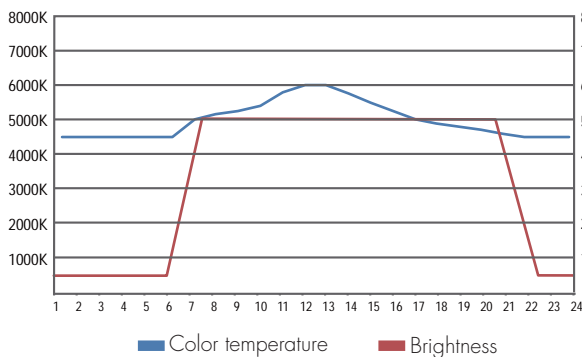
Office

Health Care

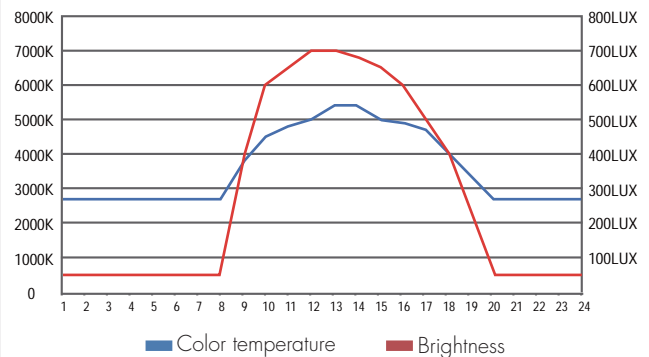
## Office and Health Care Circadian Rhythm Mode

Short press "Office" or "Health Care" button to select office circadian rhythm profile or health care circadian rhythm profile.

\* Default profile for office application



\* Default profile for health care application



## Circadian Rhythm &amp; Manual Adjustments

In circadian rhythm operation, the light brightness and color temperature will automatically change according to the selected office or health care profile. The microwave sensor will turn off the light in any unoccupied spaces, and automatically resume the above algorithm when motion is detected.

Manual adjustment of the profile is possible to suit individual lighting needs. Press and hold the "Up" "Down" buttons to change the light brightness and color temperature. The adjustments are saved and circadian rhythm profile is changed accordingly.

Notes on manual adjustments:

- 1) If the circadian rhythm curve is changed via manual adjustment, press "Office" or "Health Care" more than 3 seconds to go back to the default settings at any time.
- 2) In office mode, the default profile will be re-instated after a long period of absence (hold time has finished and the lights have automatically turned off)
- 3) In health care mode, the default profile will be re-instated at 00:00 hours.

Energise

Meeting

PPT

Relax

Neutral

Cool

Warm

## Scene Selection - Human Centric Lighting (non-circadian rhythm mode)

Each point may take commands from the remote control to suit an individuals lighting needs from any of the one-touch mood lighting pre-sets, in which the light brightness and color temperature is pre-defined. In these scene modes, the circadian rhythm profiles and photocell functions are disabled, however the occupancy sensor remains active.

Manual adjustment of the scene is possible to suit individual lighting needs. Press and hold the "Up" brightness "Down" buttons to change the light brightness, and the "Up" CCT Adjust "Down" to adjust color temperature. Any manual adjustment of a scene can be stored in the remote controller HRC-09 by a long press (>2s) on the desired scene button.

The color temperature can also be changed by a direct press on button "Neutral" "Cool" "Warm".

Note: The circadian rhythm profiles may be resumed at any time by pressing the "Office" or "Health Care" buttons.

## Technical Data

Mains voltage	120~277VAC 60Hz		
Mains current	350mA~180mA		
Mains power	40W @ 120VAC; 51W @ 277VAC		
Output voltage(U-out max.)	75VDC		
Power factor	$\geq 0.95$ (120VAC); $\geq 0.9$ (277VAC)		
Operation temperature	Ta: -20~+45°C Tc: 85°C		
Output power /current / voltage (@ 120VAC)	3~20W /350mA /10V~56V 9~36W /900mA /10V~40V	5~28W /500mA /10V~56V 10~36W /1050mA /10V~34V	7~35W /700mA /10V~50V 12~34W /1200mA /10V~28V
Output power /current / voltage (@277VAC)	3~20W /350mA /10V~56V 9~45W /900mA /10V~50V	5~28W /500mA /10V~56V 10~42W /1050mA /10V~40V	7~40W /700mA /10V~56V 12~40W /1200mA /10V~34V
Max. Efficiency	$\geq 87\%$		
Abnormal protection	Output short-circuit protection with auto-reset.		
Over-heat protection	Automatic output reduction 80%~60%~40%~20% against overheat.		
Case temperature (Tc)	85°C (max.)		
Operating temperature	-20°C ~ 45°C (ambient)		
EMC standard	FCC Part 15B		
Safety standard	UL8750		
Certification	cULus listed		
Dielectric strength	Input→output: 1500VAC/1min		
IP grade	IP20		