Circadian Rhythm

USER MANUAL

Translation of the original instructions

Version: **1.0**

Date: **09/03/2023**

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VERSION	DATE	CHANGES
1.0	09/03/2023	-

Any information inside this manual can be changed without advice.

This handbook can be download freely from the website:
www.eelectron.com

Exclusion of liability:
Despite checking that the contents of this document match the hardware and software, deviations cannot be completely excluded. We therefore cannot accept any liability for this.
Any necessary corrections will be incorporated into newer versions of this manual.

Symbol for relevant information 

Symbol for warning 

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1. Circadian Rhythm Function

The circadian rhythm function allows you to perform continuous color temperature control with lamps that manage the color temperature or the Warm and Cold components of the white light. This management is called HCL (Human Centric Light).

The working principle

The principle of HCL lighting management is to provide human-friendly room lighting that differs according to the time of day. the mix of warm and cold light (dynamic white) must follow the biological rhythm of the people who live or work in the rooms.

General

The sensor uses the date and time information that must be provided by bus; using this information, the sensor imposes, based on the parameters chosen by the user, the color temperature of the lamps considering the contribution of natural external light entering the room and the current time, practically which point is now in the circadian cycle.

The following parameters are present in the “General Parameters” page

KNX PARAMETER	SETTINGS
Date time format	DateTime (1 x 8 Bytes) Date and Time (2 x 3 Bytes)
Defines the desired format for updating the date and time on the sensor.	
Timezone	GMT + Offset GMT - Offset
Timezone Offset (ore)	0 ... 11
Timezone Offset (min)	0, 15, 30, 45
Questi tre parametri definiscono il fuso orario in cui ci si trova (inclusi eventuali offset < di 1 ora) ; come vedremo più avanti la corretta impostazione di questo parametro permette di gestire anche eventi di on/off associati ad agli orari di alba e tramonto per un certa data in una certa posizione del globo (Orologio astronomico).	
Request time at power on	no / yes
Forces the sensor to request the day / hour data on the bus after a restart.	

On the ETS page called “Circadian Rhythm” and in its subpages you can set the parameters of the light control.
The first selection to be made requires the choice between “normal circadian rhythm” and “forced circadian rhythm”.
Some parameters are common to the 2 modes such as:

KNX PARAMETER	SETTINGS
Elevation curve	wide/fast normal narrow/slow
Defines the duration of the transition phases between sunrise-noon-sunset, wide/fast curve refers to a fast transition; narrow/slow curve refers to a slow transition.	
Output mode	warm/cool lamp RGB R+G+B
Warm/cold lamp: use when lamps have 2 different ballasts, 1 per component. RGB: use when the lamps can manage 1 single command that imposes the color temperature. R + G + B: use when the lamp	
Output cyclic send time	from 0 to 2 h
Defines whether there is a cyclical sending to impose light on the lamp.	
Output send on variation	from <1% to 7%
Defines what is the minimum difference in brightness that triggers the setting of a new value for the lamp.	

The normal circadian rhythm requires to enter in ETS data relating to the position of the terrestrial globe (latitude and longitude) whose light conditions are to be simulated. You can directly enter the coordinates (expert mode) or use the simplified setting mode; for example, if you want to recreate the light conditions present at the equator in a different place (for example Legnano (MI) - Italy) you will choose Latitude = “equator” and Longitude = 8.92 (the longitude of Legnano).

KNX PARAMETER	SETTINGS
Latitude	Equator Tropic of Cancer Tropic of Capricorn expert
Select a standard latitude or a location of your choice.	
Longitude	-180 ... +180
Select the longitude of the place where the device is commissioned.	
Telegram for Daylight Saving Time activation	telegram “0” / “1”
The change from summer time to solar time and vice versa is imposed with a 1 bit telegram.	
Daylight Saving Time after download	not active / active
Daylight saving time change [*10min]	1..12
These parameters define the use of summer time if present.	
Telegram for sunrise event	telegram “0” / “1”
Sunrise event time adjustment [min]	-128 … +127
Sunset event time adjustment [min]	-128 … +127
These parameters define the actions related to the sunrise and sunset events and the relative deviation (typical application: garden lights on / off).	

The forced circadian rhythm requires to enter in ETS data relating to the duration and composition of an ideal day: a forced day. The forced rhythm repeats the same day / night cycle in the same way, this cycle can also have a duration different from 24 hours and the duration of the day and night are freely configurable.

KNX PARAMETER	SETTINGS
Restart day telegram	telegram “0” / “1”
The forced day restart can be triggered with a 1 bit telegram, with the value "0" or "1".	

Restart automatically	no / yes
Choosing "yes" at the end of the forced day a new forced day is re-started	
Day duration: hours	0 ... 31
Day duration: minutes	0 ... 59
Sunrise: hours	0 ... 31
Sunrise: minutes	0 ... 59
Sunset: hours	0 ... 31
Sunset: minutes	0 ... 59
Current time after download hour	0 ... 31
Current time after download minutes	0 ... 59
With the parameters listed above you set the duration of the forced day and the time of sunrise and sunset	

Set color temperature

The color temperature control must be done considering the type of lighting fixtures that are going to be controlled and the characteristics of warm white and cold white which can be different from lamp to lamp.

KNX PARAMETER	SETTINGS
Warm (minimum) color temperature	500 ... 3500
Cool (maximum) color temperature	3500 ... 6500
Forced color temperature after download	500 ... 6500
These parameters set the characteristics of the lamp (check the lamp datasheet) and the color temperature value at download.	
Maximum negative color adjustment [*10K]	0 ... 255
Maximum positive color variation [*10K]	0..255
Color adjustment after download	-127 ... + 128
These parameters set the limits of manual adjustment that can be made on the color temperature with a 4-bit dimming object.	
Telegram for automatic color temperature	telegram “0” / “1”
Defines the value of the 1-bit telegram which changes the color temperature control from manual to automatic (the opposite value set the manual control)	
Reset color temperature adjustment on enable/disable change	no / yes
Reset color temperature adjustment on auto/manual change	no / yes
Color temperature adjustment reset telegram	telegram “0” / “1”
These parameters define whether the manual variation imposed on the color temperature should be maintained or not.	

Set brightness

As for the color temperature, parameters are available for setting the brightness, intended as a percentage control value of the lighting fixtures.

Similarly, to what was previously seen, for the color temperature it is possible to set minimum (sunrise) and maximum (noon) brightness values; apply manual changes to the set value, switch from automatic to manual control.