Photocell

Application note

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1. Introduction

A photocell is a lighting control strategy that uses the ambient light level to automatically control the luminaires based on whether it is dark or bright. Optionally, occupancy sensors may be used to adjust the light level when occupancy is detected.

Typical photocell applications include outdoor lighting, such as area lighting, parking lots, or parking structures where the light is turned on when it gets dark and turned off when it gets bright. This solution can provide savings in energy and maintenance costs.

> ℹ️ If you want to automatically maintain the required light level based on the available daylight, see _SN-209 Silvair Daylight Harvesting_.

1.1 Requirements

- Access to the project in the Silvair web app.
- Silvair mobile app installed on an iOS or Android mobile device.
- A Bluetooth mesh light sensor.
- At least one zone configured with a control profile based on a _photocell_ scenario.
- A light meter to calibrate each _photocell_ zone if you want to use the same control profile for each zone.
- An occupancy sensor if you want to adjust the light level based on occupancy.

1.2 Features

- **Dusk to dawn control**
  When the light level reported by the light sensor falls below a defined 'Night' level, the light turns on to a 'Default' level, for example, 30%. When the light level rises above a defined 'Day' level, the light turns off or dims down, regardless of occupancy.
- **Different 'Day' and 'Night' light levels**
  This will make sure that the light does not change frequently between on (night) and off (day).
- **Transition delay**
  The light level must remain above the 'Day' level or below the 'Night' level for at least 60 seconds before the settings change from 'Night' to 'Day' and back. This ensures that the change is not a result of brief light fluctuations, like reflections or car headlights.
- **Occupancy control**
  The light level during the day or night can be adjusted to a different level when occupancy is detected.
- **Manual override**
  Manual control can override auto control. The auto control is restored when the manual override timeout has passed after the last occupancy detection. If the manual override timeout is disabled, the light level will be maintained until it is changed manually.

> ℹ️ To help your eyes adjust when moving between indoor and outdoor areas, you can set up a "reversed photocell" scenario. This means that the light turns on during the day and turns off at night, meeting the requirements for entrance and exit transition zones.
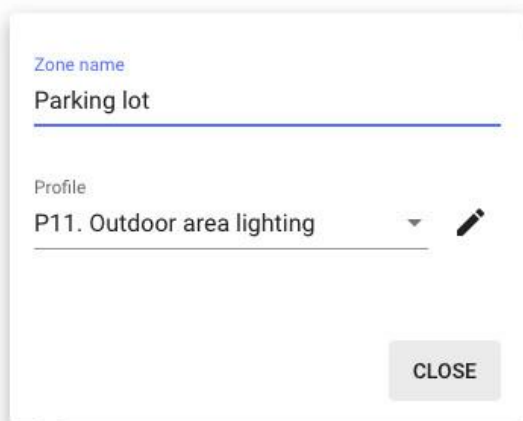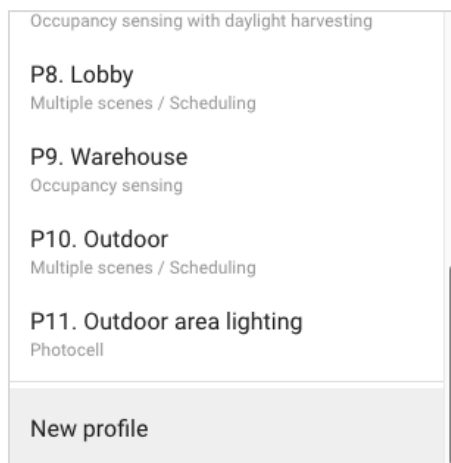
2. Commissioning

2.1 Creating and configuring the zones

1. Define lighting zones. Refer to the appropriate regulations that apply to your project.

Silvair web app

2. In the Silvair web app, go to the project and area.
3. Click on the floor or site plan to add a zone.
4. Enter a name for the zone.

5. Select a profile based on a *photocell* scenario from the list of default profiles, or create a new profile.
6. Click ✏ to edit the parameters of the profile (see Profile settings for details).
7. Repeat steps 3–6 to create more zones in this area and assign a profile with a *photocell* scenario to each zone.

   ℹ For faster commissioning without a light meter, create a separate profile for each zone. You will later need to adjust these profiles to match the light levels reported by the sensors.

   ℹ If you want to calibrate each zone with a light meter, you can use the same profile for all zones.

8. Go to the remaining areas and repeat steps 3–7 to create zones and assign a profile with a *photocell* scenario to each zone.

2.2 Calibrating the zones

1. Go on site to a zone with a *photocell* scenario.

Silvair mobile app

2. In the **Silvair mobile app**, go to the project, area, and zone.
3. Add devices to the zone.

> ❗ Make sure that there is no warning on the **Devices** tab. If there is a warning, tap **Configure all** or **Repair**.

4. On the **Devices** tab, tap **Calibrate**.
5. Tap a toggle switch to select the correct sensor for the zone. To find the sensor, tap ☌ next to a sensor name to make sure that the correct sensor flashes.
6. (only for calibrating with a light meter and using the same profile for all *photocell* zones)
   a. Tap **Show advanced settings**.
   b. Put the light meter vertically below the selected sensor.
   c. In the **Measured light level** field, enter the value shown on the light meter in lux (lx).
7. Tap **Calibrate**. The selected sensor will be calibrated.

> ℹ If you have entered a value in the **Measured light level** field, the sensor will be calibrated based on the value measured by the light meter.

> ℹ After the calibration is completed, the calibrated zone goes to auto mode. All other linked zones go to their occupancy light level.

> ❗ If you change or replace the sensor, you must calibrate again.

8. Repeat steps 3–7 for each *photocell* zone.

Silvair web app
(only for separate profiles for each *photocell* zone)

9. For each *photocell* zone, monitor the behavior of the light control at dawn and dusk. If the light turns on or off too early or too late, go to the **Silvair web app** and adjust the profile for the zone:
   a. If the light turns on too early, decrease 'Night starts below'.
   b. If the light turns on too late, increase 'Night starts below'.
   c. If the light turns off too early, decrease 'Day starts below'.
   d. If the light turns off too late, increase 'Day starts below'.

Silvair mobile app
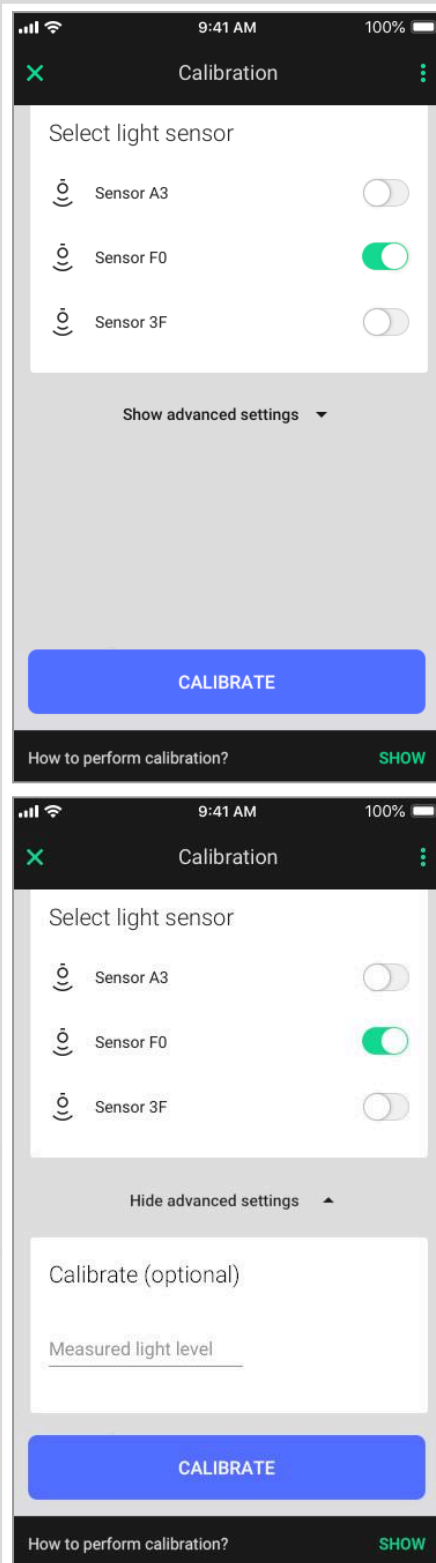
10. In the **Silvair mobile app**, go to the project and area, and click **Configure**.

3. Profile settings

Setting	Description
Night	
Night starts below	The light level below which the light is switched to the night settings. Must be lower than the "Day starts above" light level.
Default light level	The light level to which the light is switched on when it gets dark. If the "Occupancy" setting is enabled, this will trigger only when the space is vacant.
Occupancy	The light level to which the light is switched on when occupancy is detected. Available when the "Adjust light when occupied" checkbox is selected.
Day	
Day starts above	The light level above which the light is switched to the day settings. Must be higher than the "Night starts below" light level.
Default light level	The light level to which the light is switched on when it gets bright. If the "Occupancy" setting is enabled, this will trigger only when the space is vacant.
Occupancy	The light level to which the light is switched on when occupancy is detected. Available when the "Adjust light when occupied" checkbox is selected.
Occupancy timeout	The time for which the light is maintained at the "Occupancy" level after occupancy is detected. Available only when the "Adjust light when occupied" checkbox is selected for "Day" or "Night" settings.
Fade time	The time of transition between two defined light levels.
Manual override timeout	The time of vacancy after which the light goes back to its default settings. When disabled, the automatic operation must be restored manually.
Power up behavior	
Keep light off	The light will remain off on power up.
Restore	The light will return to the last level before the power failure.
Defined light level	The light will come on at this level on power up.
Low/high-end trim	
Min.	The minimum light level that can be achieved manually with a wall switch or automatically.
Max.	The maximum light level that can be achieved manually with a wall switch or automatically.

4. Example applications

4.1 Basic photocell profile for outdoor lighting

LIGHTING CONTROL BEHAVIOR	page
Night	When the light level measured by the light sensor falls below 35 lux, the luminaires turn on to 100%.
Day	When the light level measured by the light sensor rises above 70 lux, the luminaires turn off.
Manual control	After manual control is used, auto mode must be restored manually.

Scenario settings

Night

Night starts below	35 lux
Default light level	100%

Day

Day starts above	70 lux
Default light level	0%

Fade time	1 sec

Manual override timeout	Disabled

Low/high-end trim

Min.	0%
Max.	100%

Power up behavior	Restore

4.2 Reversed photocell for entrance or exit zones

LIGHTING CONTROL BEHAVIOR

Night	When the light level measured by the light sensor falls below 35 lux, the luminaires turn off.
Day	When the light level measured by the light sensor raises above 70 lux, the luminaires turn on to 100%.
Manual control	After manual control is used, auto mode must be restored manually.

Scenario settings

Night

Night starts below	35 lux
Default light level	0%

Day

Day starts above	70 lux
Default light level	100%

Fade time	1 sec

Manual override timeout	Disabled

Low/high-end trim

Min.	0%
Max.	100%

Power up behavior	Restore

4.3 Photocell with occupancy for a parking lot

LIGHTING CONTROL BEHAVIOR

Night	When the light level measured by the light sensor falls below 35 lux, the luminaires turn on to 30%.
	When occupancy is detected, the luminaires are set to 100%. After 20 minutes of vacancy, the luminaires are set back to 30%.
Day	When the light level measured by the light sensor rises above 70 lux, the luminaires turn off.
Manual control	After manual control is used and 2 hours of vacancy, the luminaires return to auto mode.

Scenario settings

Night

Night starts below	35 lux
Default light level	30%
Occupancy light level	100%

Day

Day starts above	70 lux
Default light level	0%

Occupancy timeout   20 min

Fade time   1 sec

Manual override timeout   2 hrs

Low/high-end trim

Min.	0%
Max.	100%

Power up behavior   Restore

5. Troubleshooting

5.1 Light switches off immediately after it is switched on

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1. In the **Silvair mobile app**, go to the project, area, and zone.
2. Go to the **Test** tab.
3. Set the light to 100% and read the lux level reported by the sensor on the **Sensors** view.
4. Set the light to 0% and read the lux level reported by the sensor on the **Sensors** view.
5. Calculate the difference between sensor readings from steps 3 and 4.

Silvair web app

6. In the [Silvair web app](), go to the project and area.
7. Click on the zone and then click ✏.
8. Set the **Day starts above** and the **Night starts below** parameters so that the difference between them is higher than the value calculated at step 5.
9. Click **Save**.

Silvair mobile app

10. On the **Devices** tab, tap **Configure all**.

6. Document revisions

Revision	Date	Editor	Changes
2.0	18 March 2024	GM	Implemented template rev. 1.2. The entire document has been edited to make it clear and easy to follow.
1.1	29 October 2020	LR, SR	Added legal notice. Some corrections and clarifications.
1.0	7 May 2020	LR, SR	Initial revision.

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