

smartLEDs

S2-P

SMART STAIR LED LIGHTING CONTROLLER model PREMIUM

USER MANUAL v5.0.6

Download the full-color version of this manual from magicstairlighting.com, tab DOWNLOADS, where you will also find a comprehensive guide to installing smart stair LED lighting system.



In accordance with the provisions of the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) it is forbidden to place with other waste any waste equipment marked with a crossed-out bin symbol.

The user, wanting to get rid of electronic equipment or services, is obliged to return it to a waste equipment collection point. Applicable restrictions have been introduced in order to restrict the amount of waste generated from waste electronic equipment.

This equipment does not contain any hazardous ingredients that may have a particularly negative impact on the environment and human health.

1 DESCRIPTION

S2-P is microprocessor controller for multi-spot 12V/24V LED lighting, intended for LED lighting of staircases (and other passageways), with common control of all lamps. The device turns on LED lamps (in one or two steps), and then turns them off after a specified time. In the case of dimmable lamps, the turning on and off happens gradually and smoothly. The controller can also provide gentle backlight lighting as well as react to motion and dusk.

S2-P is equipped with:

- built-in configurator capable of setting 16 parameters, e.g. brightness; timing, speed, and smoothness of turning on/off; warning when the lights are about to turn off; and many more, which enables the users to set the device up according to their needs;
- integrated dusk switch (IDS) which disables the controller during daylight, with a light sensor that can be installed both indoors and outdoors.

1.1 Technical specifications

Power supply	8–24VDC / 100mA, SELV
Power supply current	10mA (average)
Power consumption	120mW
No. channels	2
Output voltage (max)	24V DC
Output load (max)	2A each
Load type	LED
Protection index	IP20
Safety class	III
Usage	continuous, indoors
Working temperature	from –10°C to +45°C
Housing dimensions	35 x 90 x 65mm (2 modules)
Installation	35mm DIN rail

1.2 Terminals

The controller's terminals are depicted above.

1.2.1 Power supply

The controller requires external power supply with regulated DC output, safety extra-low voltage (SELV) in the range of 8–24 V DC; it should also have a minimum current load of 100 mA. The power is supplied to the GND terminal (ground, minus) and the 12V terminal (plus).

CAUTION! Only use power supplies marked **CE** and with galvanic separation between the output voltage and the mains supply.

1.2.2 Inputs

The controller has the following inputs:

- UP, DN and MID ports which control turning on of the lamps: upward, downward and both directions from the mid-floor respectively, and



- DIS port for disabling the controller, used for example for connecting the light sensor or an external switch.

The inputs should be fed with a potential-free signal of either connection (ZERO) or non-connection (ONE) to ground GND.

CAUTION! *The only external dusk sensors and clocks suitable for using with S2-P are those marked CE and with galvanic insulation of the output voltage and the mains supply.*

1.2.3 Outputs

S2-P has 2 outputs L1-L2 that control the LED lamps connected to them. Any LED lamps powered with SELV of up to 24 V DC can be used, provided that they are supplied from a DC SELV power supply (up to 24 V) with a galvanic insulation of the output voltage from the mains supply. The maximum current must not exceed 2 A per single output. The outputs should be connected to the negative terminal (cathode) of the LED lamps.

The outputs can be used either with dimmable LED lamps (smooth turning on/off, gentle backlight lighting), as well as non-dimmable (instantaneous turning on/off, no backlight lighting).

The L2 output can be used as the Master lamp; this lamp is turned on first and turned off last.

1.3 Configurator

The parameters of S2-P may be set up with the integrated configurator (see Sec. 2).

1.4 Integrated dusk switch (IDS) with a light sensor

S2-P is equipped with an integrated dusk switch (IDS). The IDS disables the controller's operation during daylight, and is activated by (i) connecting the light sensor to the DIS port and (ii) setting the threshold light level by configuring the **DIS input** parameter to a value between S1 and S10. The IDS responds only to long-term changes in light conditions, ignoring any short-term fluctuations. The light sensor may work both outdoors and indoors, which makes it more convenient than external dusk sensors that work properly only when exposed to natural sunlight (any artificial light sources can cause malfunction of external dusk sensors).

1.5 Controller's operation

The default state of the controller is the standby state when no inputs are active. In this state dimmable lamps may be either off or on with gentle backlight; non-dimmable lamps are off. The controller is awaiting a signal either at the DIS port (which will disable the controller and turn all the lights off) or from any of the UP /DN/MID inputs (which will start the lighting sequence).

CAUTION! *During the normal operation of the controller, the LEDs on the electronic board (see Sec. 2) indicate whether S2 is in the active state (GREEN diode on) or blocked (RED diode on).*

The S2 lighting sequence consists of successive phases: turning on, lights on, warning (if set) and turning off.

1.5.1 Turning lamps on

The 'turning-on' phase consists of turning on consecutive lamps:

- L1 and then L2, if the signal came from the UP input;
- L2 and then L1, if the signal came from the DN input;
- L1 and L2 simultaneously, if the signal came from the MID input.

If another signal appears at the other input while the lamps are being turned on, the sequence will also start from the other side.

If applicable, the Master lamp (L2) is turned on first, either before or at the same time as L1. The smoothness of the turning on of the lamps can be set within a broad scope by setting the **Smoothness** parameter: from sharp to very smooth turning on.

1.5.2 Lights on

When the lights are on, they remain on for a time predefined by the **On time** parameter. The time extends when a new signal appears at any of the inputs.

1.5.3 Warning

When the time determined by the **On time** parameter passes, either the lights turn off (if the **Number of warnings** parameter is set to 0) or the controller enters the warning phase (if **Number of warnings** is greater than 0). The warning phase informs the user that the lights are about to turn off. The phase consists of a number of ‘warning–waiting’ cycles consisting of the warning and awaiting the user’s reaction. The warning can be either a short dimming of lights (a ‘blink’) or alternate dimming of L1 and L2 (a ‘flicker’).

1.5.4 Turning lamps off

Turning off the lamps is defined as dimming the lights from the full brightness to the backlight level brightness.

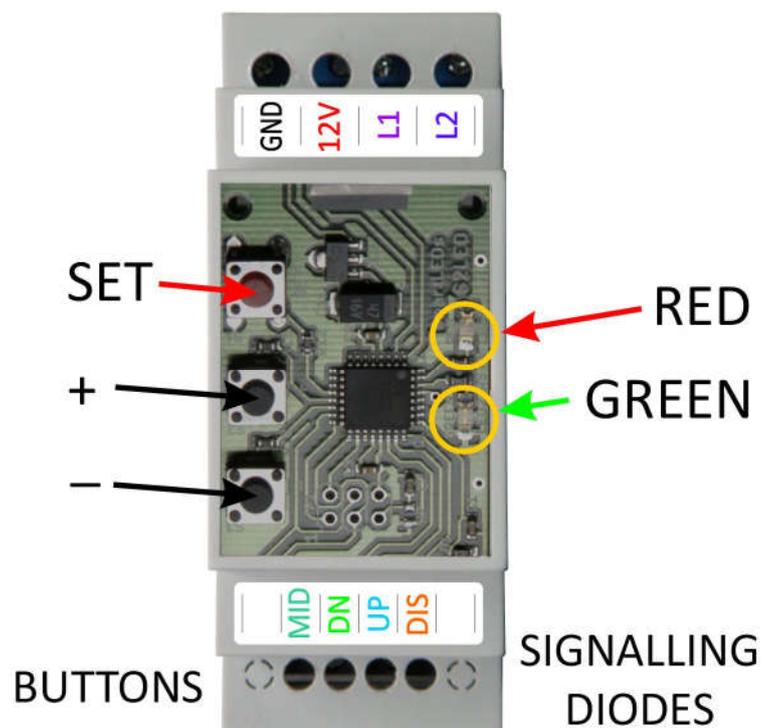
The ‘turning-off’ phase is reversed with respect to the turning-on phase: the lamps are turned off either as they were turned on or in the reverse order (depending on the setting of the **Off direction** parameter). The Master lamp (if set) is turned off last. The smoothness of the turning off is the same as in the case of turning on, and set with the **Smoothness** parameter.

2 CONFIGURATION MANUAL

2.1 Introduction

The controller is configured with the built-in Configurator shown above.

The Configurator consists of three configurational buttons (SET, ‘+’, and ‘-’), and two signalling LEDs, RED and GREEN. The SET button increments the number of the parameter being set or exits the configuration procedure. The ‘+’ and ‘-’ buttons change the value of the parameter being set.



2.2 Configuration

To begin the configuration, follow the steps 2.2.1–2.2.2 below.

2.2.1 Get access to Configurator

Open the controller casing (by removing the front cover).

2.2.2 Put the controller into configuration mode

Put the controller into the configuration mode by pressing and holding the SET button until both signalling diodes start blinking quickly (please be patient; it may take about 4 seconds); then release the SET button.

2.3 Setting configuration parameters

The configuration parameters are stored in the non-volatile memory (also after the device is switched off). The controller is shipped with the parameters preset to default values (see Table 1).

The parameters can be set in accordance with Table 1.

The configuration is done in a loop of 17 steps, setting one parameter per step in all the first 16 steps except the final one. The final step allows to either restart the configuration from step 1 or to finish the configuration. If the latter case, three options are given: (1) to save the new configuration, (2) to discard the new configuration, or (3) to restore the factory settings.

At each step the Configurator displays, through the signalling diodes, the step number and the present value of the parameter being set. The current value is communicated through a repeating series of flashes of the GREEN diode, in accordance with Table 1. At the same time, the step number is communicated by the number of flashes of the RED diode. To illustrate: a repeating single flash of the RED diode means the parameter being set is **Master Lamp** (parameter no. 1), while 0 consecutive flashes in a series of the GREEN diode means the current setting is 'no Master lamp.' To change the value of the parameter, use the '–' and '+' buttons (selecting the preceding or the next value from Table 1, respectively). Having set the value of the parameter (or when we want to leave its value unchanged), we move to the next step by pushing the SET button briefly (under 2 seconds).

Reaching the final (17th) step in the loop is signalled by the RED diode giving off a steady light. There are then two possibilities:

- To return to the beginning of the configuration loop, i.e. the first step, in order to repeat all the steps and correct the settings, press the SET button briefly (under 2 seconds).
- Choose the desired value of the **Decision?** parameter with the '–' and '+' buttons, then press and hold the SET button until both diodes switch off (>4s). Selecting the value SAVE will result in saving the new configuration in the non-volatile memory of the controller. Selecting the value QUIT will result in discarding the new configuration and restoring the previous configuration. Selecting the value RESTORE will bring back the factory defaults.

CAUTION! *Pressing the SET button briefly (under 2 seconds) will always advance the configuration process to the next step.*

CAUTION! Pressing and holding (for at least 4 seconds) the SET button (at every step except **Decision?**) or cutting off the power supply will cause the configuration process to exit without saving the new parameters.

CAUTION! The built-in Configurator is capable of setting only the parameters shown in Table 1.

CAUTION! Pressing '+' when the maximum value is displayed moves the selection to the first value; and pressing '-' when the first value is displayed moves the selection to the maximum value.

CAUTION! If no button is pressed for about 30 minutes, the controller will quit the configuration mode.

CAUTION! Exiting the configuration with saving the new settings is possible only in the last step of the sequence (**Decision?**), with the value set to SAVE.

CAUTION! The electronics board is sensitive to electrostatic charges which can damage the controller. Before opening the controller, discharge accumulated loads by touching a grounded object with your hand. You should also be particularly careful (protect against foreign voltage, short circuit, flooding, etc.) so as not to damage the controller.

CAUTION! Due to the difficult access, you may need to use a long, pointed object such as a pencil or toothpick (it must not be a conductive object, e.g. metal) to press the buttons.

CAUTION! In Configuration mode, LED lamps may be in a random state.

2.1 Parameters set by Configurator

CAUTION! Changing the parameters indicated as '[advanced]' substantially affects the operation of the controller, and it is recommended to change these with caution.

2.1.1 Master lamp

Allows to decide whether L2 is to be used as a master lamp; if the Master lamp is dimmable; and if the Master lamp should be turned on one step before or together with the start of the lighting sequence.

2.1.2 Number of warnings

The number of the 'warning-waiting' cycles; '0' means no warnings.

2.1.3 Warning type

The style the warning is displayed.

2.1.4 Step type

The pace of the turning on and off of the consecutive lamps in the sequence.

2.1.5 Off direction

The order of turning off the consecutive lamps (the same as the turning on or the opposite).

2.1.6 Smoothness

The smoothness of the dimming/brightening of the lamps. This parameter determines the visual effect of the dimming/brightening: low values of smoothness make the process energetic, while high values make it smooth and gentle. There are seven values to choose from. In the case of non-dimmable lamps the parameter must be set to 0; then there is no backlight lighting and the turning on and off proceeds in a one-by-one switching fashion.

2.1.7 Brightness

The brightness of the LED lamps.

CAUTION! While this parameter is being set, lamps L1 and L2 are lit with intensities corresponding to the values of the **Brightness** and **Backlight lighting** parameters, respectively.

2.1.8 Backlight lighting

The brightness of the backlight lighting of the LED lamps during stand-by, expressed as the percentage of the brightness set by the **Brightness** parameter.

CAUTION! While this parameter is being set, lamps L1 and L2 are lit with intensities corresponding to the values of the **Backlight lighting** and **Brightness** parameters, respectively.

2.1.9 Master brightness

The brightness of the Master lamp.

CAUTION! While setting this parameter, L2 is lit with a brightness corresponding to this parameter.

2.1.10 Master backlight

The stand-by backlight value of the Master lamp (expressed as a percentage of the Master brightness parameter).

CAUTION! While setting this parameter, L2 is lit with a brightness corresponding to this parameter.

2.1.11 Turning-on time

The time elapsed between the start of the first and the last lamp turning on.

2.1.12 On time

Determines how long the lamps remain on.

2.1.13 Warning time

The duration of a single warning.

2.1.14 Waiting time

Determines the 'waiting' time of the 'warning-waiting' cycle, when the controller awaits the user's reaction after a warning.

2.1.15 Turning-off time

The time elapsed between the start of the first and the last lamp turning off.

2.1.16 Active level [advanced]

The level (ZERO or ONE) defined as the active state at the controller inputs.

CAUTION! An input left floating has the value ONE. Setting the active level to ONE while an input is left floating will result in a permanent active state.

2.1.17 2. DIS input [advanced]

Determines what is done with the active state at the DIS input. The possible parameters are: BLOCK, UNBLOCK, TOGGLE, and S1, S2, ..., S10. Selecting one of the values S1–S10 activates the built-in dusk switch. The values from S1 (darkest) to S10 (brightest) determine the external light threshold of the dusk sensor above which the switch blocks the controller.

CAUTION! Setting the parameter to one of S1, ..., S10 with the sensor disconnected will result in the controller not being blocked during daylight.

CAUTION! For the built-in dusk switch to work correctly, it is necessary to connect the enclosed sensor to the DIS terminal.

CAUTION! Setting the parameter to TOGGLE allows for controlling the DIS input manually with a pushbutton. With this setting, the controller by default starts in the active state when the power supply is turned on.

CAUTION! The default settings of the parameters **Active level** and **DIS input** are appropriate when the DIS port is left floating.

2.1.18 Decision?

This is the final step in the configuration process. Pressing the SET button briefly (< 2 s) restarts the configuration process. Pressing it longer (> 4 s) exits the configurator. Choosing the SAVE option and pressing the SET button long exits the configurator with the new configuration saved. Selecting the QUIT option and then pressing the SET button long results in abandoning the configuration and restoring the prior settings. Similarly for the RESTORE option: the configuration process will be halted and the factory settings brought back.

CAUTION! To confirm the selected option (SAVE, QUIT, or RESTORE), press the SET button and hold for at least 4 s until both signalling diodes go off.

Table 1. S2-P configuration using built-in Configurator (default values are **bolded** and **underlined**)

Parameter	Value	RED diode (# of flashes)	GREEN diode (# of flashes)	Remarks
Start of configuration		fast blinking until SET released	fast blinking until SET released	SET button pressed for >4s
Master lamp				
	NO	1	not flashing	no Master lamp
	BRIGHTEN TOGETHER	1	<u>1</u>	Master dimmable, brightened together with the first lamp
	BRIGHTEN BEFORE	1	2	Master dimmable, brightened before the first lamp
	SWITCH TOGETHER	1	3	Master not dimmable, turned on together with the first lamp
	SWITCH BEFORE	1	4	Master not dimmable, turned on before the first lamp
Number of warnings				
	0	2	not flashing	no warnings
	<u>1</u>	2	<u>1</u>	1 warning
	2	2	2	2 warnings
	3	2	3	3 warnings
	4	2	4	4 warnings
	5	2	5	5 warnings
	6	2	6	6 warnings
	7	2	7	7 warnings
Warning type				
	BLINK	3	not flashing	blink
	PICO	3	1	very fast flicker
	NANO	3	2	fast flicker
	MICRO	3	3	medium flicker

	MILI	3	4	slow flicker
Off direction				
	BACKWARD	4	not flashing	turning off in opposite direction as turning on
	FORWARD	4	<u>1</u>	turning off in the same direction as turning on
Smoothness				
	0	5	not flashing	not dimmable lamps
	1	5	1	sharp brightening/dimming
	2	5	2	
	3	5	3	
	4	5	4	smooth brightening/dimming
	<u>5</u>	5	<u>5</u>	
	6	5	6	
	7	5	7	very smooth brightening/dimming
Brightness				
	10%	6	3	10% max brightness
	20%	6	4	20% max brightness
	30%	6	5	30% max brightness
	40%	6	6	40% max brightness
	50%	6	7	50% max brightness
	60%	6	8	60% max brightness
	70%	6	9	70% max brightness
	80%	6	10	80% max brightness
	90%	6	11	90% max brightness
	<u>100%</u>	6	<u>12</u>	100% max brightness
Backlight lighting				
	0%	7	not flashing	no backlight lighting
	<u>2%</u>	7	<u>1</u>	2% brightness
	5%	7	2	5% brightness
	10%	7	3	10% brightness
	20%	7	4	20% brightness
	30%	7	5	30% brightness
	40%	7	6	40% brightness
	50%	7	7	50% brightness
	60%	7	8	60% brightness
	70%	7	9	70% brightness
	80%	7	10	80% brightness
	90%	7	11	90% brightness
Master brightness				
	10%	8	3	10% max brightness
	20%	8	4	20% max brightness
	30%	8	5	30% max brightness
	40%	8	6	40% max brightness
	50%	8	7	40% max brightness
	60%	8	8	60% max brightness
	70%	8	9	70% max brightness
	80%	8	10	80% max brightness
	90%	8	11	90% max brightness
	<u>100%</u>	8	<u>12</u>	100% max brightness
Master backlight				
	<u>0%</u>	9	not flashing	no backlight lighting

	2%	9	1	2% Master brightness
	5%	9	2	5% Master brightness
	10%	9	3	10% Master brightness
	20%	9	4	20% Master brightness
	30%	9	4	30% Master brightness
	40%	9	6	40% Master brightness
	50%	9	7	40% Master brightness
	60%	9	8	60% Master brightness
	70%	9	9	70% Master brightness
	80%	9	10	80% Master brightness
	90%	9	11	90% Master brightness
	100%	9	12	100% Master brightness
Turning-on time				
	0s	10	not flashing	simultaneous turning on
	0,4s	10	1	turning-on time: 0,4s
	1s	10	2	turning-on time: 1s
	2s	10	3	turning-on time: 2s
	3s	10	4	turning-on time: 3s
	4s	10	5	turning-on time: 4s
	6s	10	6	turning-on time: 6s
	9s	10	7	turning-on time: 9s
	12s	10	8	turning-on time: 12s
	18s	10	9	turning-on time: 18s
	24s	10	10	turning-on time: 24s
On time				
	0s	11	not flashing	no lights-on phase
	4s	11	1	on time: 4s
	10s	11	2	on time: 10s
	20s	11	3	on time: 20s
	30s	11	4	on time: 30s
	40s	11	5	on time: 40s
	60s	11	6	on time: 1min.
	90s	11	7	on time: 1,5min.
	120s	11	8	on time: 2min.
	180s	11	9	on time: 3min.
	240s	11	10	on time: 4min.
Warning time				
	0s	12	not flashing	no warning
	0,4s	12	1	warning time: 0,4s
	1s	12	2	warning time: 1s
	2s	12	3	warning time: 2s
	3s	12	4	warning time: 3s
	4s	12	5	warning time: 4s
	6s	12	6	warning time: 6s
	9s	12	7	warning time: 9s
	12s	12	8	warning time: 12s
	18s	12	9	warning time: 18s
	24s	12	10	warning time: 24s
Waiting time				
	0s	13	not flashing	no waiting
	0,4s	13	1	waiting time: 0,4s
	1s	13	2	waiting time: 1s

	2s	13	3	waiting time: 2s
	3s	13	4	waiting time: 3s
	<u>4s</u>	13	<u>5</u>	waiting time: 4s
	6s	13	6	waiting time: 6s
	9s	13	7	waiting time: 9s
	12s	13	8	waiting time: 12s
	18s	13	9	waiting time: 18s
	24s	13	10	waiting time: 24s
Turning-off time				
	0s	14	not flashing	simultaneous turning-off
	0,4s	14	1	turning-off time: 0,4s
	<u>1s</u>	14	<u>2</u>	turning-off time: 1s
	2s	14	3	turning-off time: 2s
	3s	14	4	turning-off time: 3s
	4s	14	5	turning-off time: 4s
	6s	14	6	turning-off time: 6s
	9s	14	7	turning-off time: 9s
	12s	14	8	turning-off time: 12s
	18s	14	9	turning-off time: 18s
	24s	14	10	turning-off time: 24s
Active level				
	<u>ZERO</u>	15	<u>not flashing</u>	connected to GND
	ONE	15	1	disconnected from GND
DIS input				
	<u>DISABLE</u>	16	<u>not flashing</u>	active level of DIS disables the controller
	ENABLE	16	1	active level of DIS enables the controller
	TOGGLE	16	2	active level toggles DIS input
	S1	16	3	threshold brightness S1
	S2	16	4	threshold brightness S2
	S3	16	5	threshold brightness S3
	S4	16	6	threshold brightness S4
	S5	16	7	threshold brightness S5
	S6	16	8	threshold brightness S6
	S7	16	9	threshold brightness S7
	S8	16	10	threshold brightness S8
	S9	16	11	threshold brightness S9
	S10	16	12	threshold brightness S10
Decision?				
		on	any	SET pressed <2s – continue configuration – move to step 1
	<u>SAVE</u>	on	<u>1</u>	SET pressed >4s (until GREEN diode stops blinking) – save new settings and finish configuration
	QUIT	on	2	SET pressed >4s (until GREEN diode stops blinking) – quit configuration without saving new settings
	RESTORE	on	3	SET pressed >4s (until GREEN diode stops blinking) – restore factory settings and finish configuration
normal function		free	free	„+“ „-“ and SET buttons released

3 Installation Guide

The S2-P controller is a versatile device with numerous possible applications. The diagram below depicts an example of the most common installation.

The standard modular housing allows the controller to be installed in small electrical boxes on a standard DIN rail, which simplifies the installation considerably.

CAUTION! *Installing the controller requires technical knowledge and experience and should be carried out by a qualified person. Connection of the power supply to the mains may only be done by a qualified electrician.*

CAUTION! *All installation proceedings should be carried out with the power supply disconnected. The voltage may only be turned on once it has been ensured all connections are correct.*

CAUTION! *A particular caution is advised when connecting the control inputs (UP, DN, DIS). These are potential-free inputs and no voltage should be applied to them as it may result in burning of the controller. Please ensure that any control device (e.g. motion sensors, including those powered with 12V) do not apply any voltage onto these inputs.*

CAUTION! *We advise particular caution also when connecting the controller's outputs. Before connecting the output circuits (LED lamps) please ensure there are no short circuits. A short circuit (or overload) at any of the outputs may result in burning of the controller.*

The installation should follow this order:

- 1 Connect all LED lamps / LED strips and the power supply to the controller. For now, do not connect anything to the controller inputs (UP, MID, DN, DIS).
- 2 Check if all connections are correct and faultless: if carried out in accordance with the installation diagram, if there are no short nor open circuits, if the polarity is set correctly, etc.
- 3 Insulate the connections.
- 4 Turn the power on. All LED strips should light up to the backlight value (ordinary lamps - 2% brightness; Master lamp - off).
- 5 Connect the OUT output of the lower DELTA sensor to the UP input. Remove the sensor cover. Detection of a person by the DELTA sensor is signalled by the lighting of the green LED on the front of the sensor and should cause smooth switching on of L1 and L2, and after about 30 seconds from the end of the detection by the sensor, the lights should smoothly dim (to the backlight level).
- 6 Repeat the operation from p. 5 for the DOWN sensor and, in the case of a mid-floor installation, for the MID sensor.
- 7 The next step is connecting the light probe, switch or timer to the DIS input. The probe, switch and timer has 2 output terminals: one should be connected to GND and the other one to the DIS input of the stair controller, according to the assembly diagram. In case of light probe, in order to activate the internal dusk switch, it is necessary to change the DIS input parameter to one of the values from S1 (darkest) to S10 (brightest). Depending on the brightness detected the IDS should switch the controller to active (if it's dark) or blocked (if it's bright) state with certain delay.
- 8 In the last step, if necessary, configure other controller parameters.

Remember to make any manipulations and changes in the installation with the power off. Even a short-term occurrence of voltage on the wrong outlet of the controller can permanently damage the

controller, and such damage is not covered by the warranty. Turn the power on only when you are sure that everything is connected properly.

3.1 EXAMPLE DIAGRAM. Typical staircase installation of S2-P, with a common power supply for the controller, sensors and lamps; with an optional Master lamp; controlled by staircase sensors DELTA; with built-in dusk sensor; and with the option to switch on the lamps permanently.

Assumptions:

- 2 groups of LED staircase lamps (L2 as the upper stair level lamps or, alternatively, Master lamp (ceiling/wall light or handrail backlight))
- common power supply of the controller, DELTA sensors and LED lamps (typically 12 VDC)
- automatic turning on the lights by DELTA sensors
- option: permanent steady lighting with additional switches
- blocking the controller during daylight with a built-in dusk switch.

