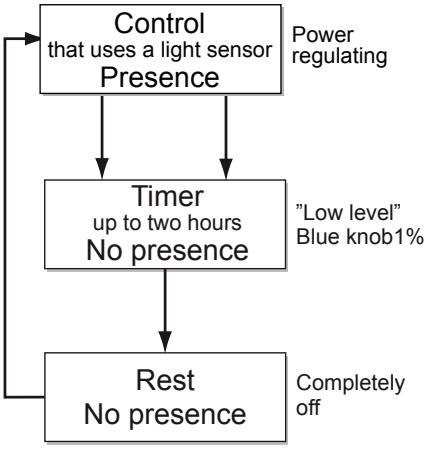
LEVEL SWITCH NP-3T DL v1.0

Installation instructions

Order no. 13181 E-no. 13 060 81



Description

The NP-3T DL level switch is intended for daylight control using dynamic lighting control of dimmable light fittings with digital DALI control, in order to reduce the lighting time of fluorescent light sources and prolong their life. It also adapts to external light from the sun and other sources by means of a connected light sensor. It is used in combination with one or more presence detectors (e.g. PD-2200) in areas such as **offices, classrooms** and **corridors.** See the application examples in this manual, in the Planning Guide in the Extronic handbook and at www.extronic.se, (see also applications for NV-3TR).

Dynamic lighting control

Dynamic lighting control means that the output (lighting level) is adjusted to a normal lighting level when presence is detected in the premises (the normal lighting level is adjusted according to the natural light level and is limited by the setting for the max. lighting output). When presence is no longer detected the lighting is reduced to the base level (the lowest possible level, often 1–2 per cent).
If someone enters the premises again the lighting is ramped up to the normal level.
If the premises remain empty until the timer in NP-3T DL has counted down (recommended setting 1–2 hours), the lighting is switched off completely.
The reason why the lighting is not switched off as soon as the premises are empty is that frequent switching causes accelerated wear to the fluorescent tubes and shortens their lives. If LED light fittings are installed, this feature can be used to provide background lighting or ambient lighting.

Basic operation

- When someone enters the premises the lighting is switched on at the normal level (daylight-dependent) when presence is detected by the presence detector.
- When presence is no longer detected the lighting is dimmed to the base level (Low level) and the timer starts counting down the preset time (0–120 minutes).
- When this time has run out the lighting is switched off completely.

If someone enters the premises while the timer is counting down, the lighting is switched from the base level to the normal level, and the timer restarts the countdown when presence is no longer detected. If someone enters the premises when the lighting has been switched off completely, it is immediately switched back on at the normal level.

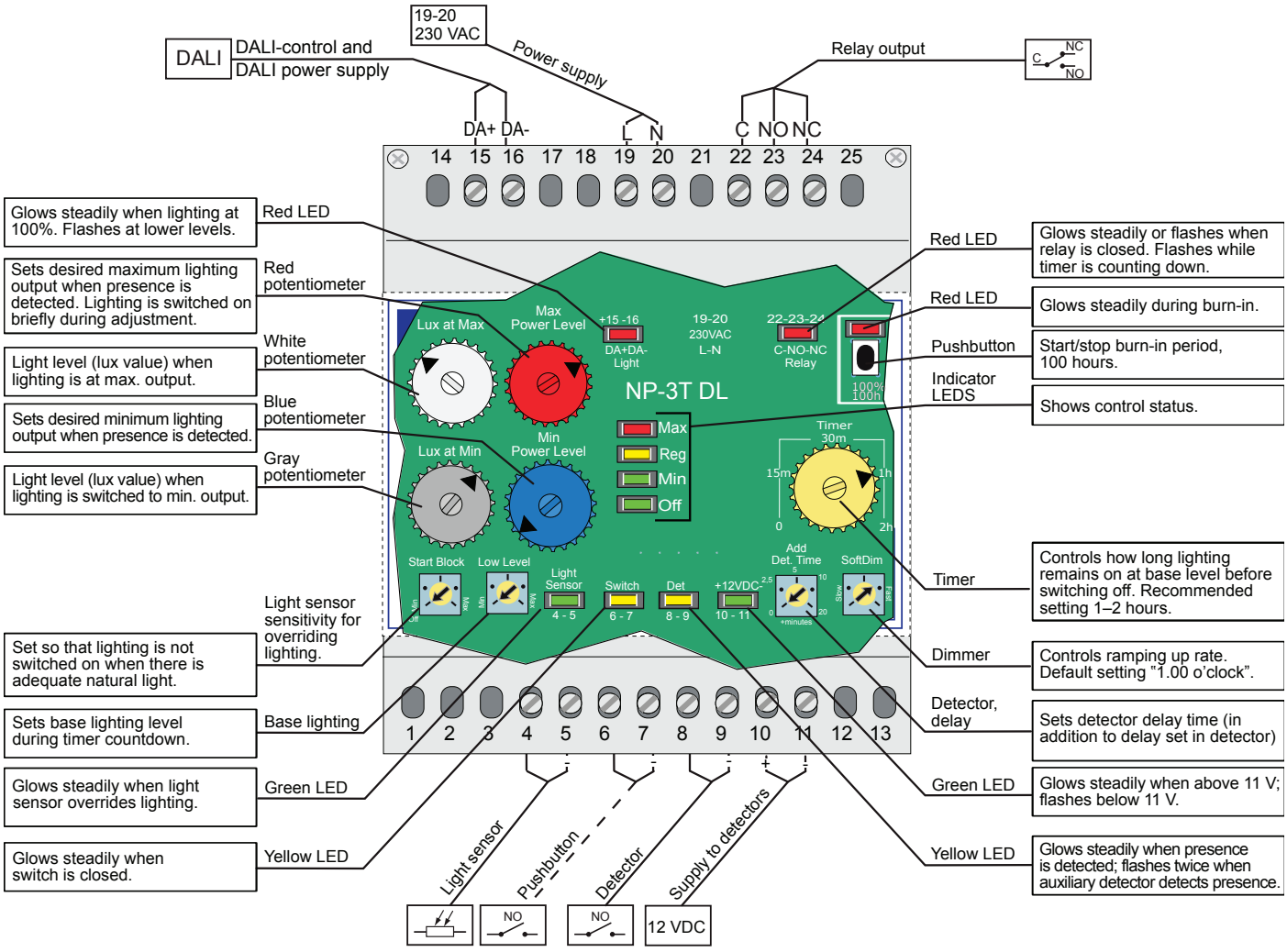
Features

- **Comfort lighting control** is a form of **daylight control** that uses a light sensor and fuzzy logic to continuously adjust the lighting between two levels: Lux at Max and Lux at Min. See the section on Comfort lighting control for more information.
- **Control DALI light fittings** using broadcast commands.
- **No programming is required**.
- **Built-in power supply for DALI bus.**
- **Supply voltage 230 VAC**.
- **Add Detector Time.** Allows detector delay time to be set in addition to time in detector.
- **SoftDim** allows the lighting to be ramped up and down gradually. The ramp-up rate is adjustable, but the dimming rate is fixed.
- **Fluorescent tube burn-in**. A button that delivers 100 per cent power for 100 hours to burn in new tubes.

Inputs and outputs

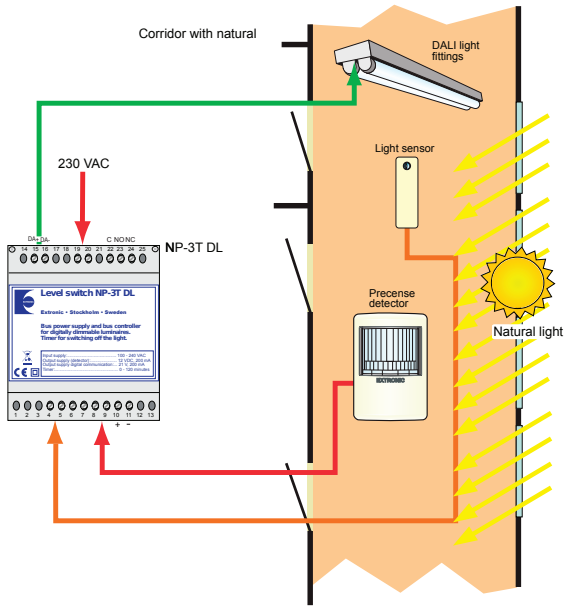
- **Output for DALI light fittings**.
- **Input for presence detector** or logic module.
- **Input for light sensor**.
- **Input for pushbutton**. If one or more pushbuttons are connected (in parallel) the lighting can be switched on or off and ramped up or down manually.
- **Relay output** for driving a contactor (timer 0–120 minutes).
- **12 VDC supply** for IR detectors (max. 8 detectors).

Features, connections and settings



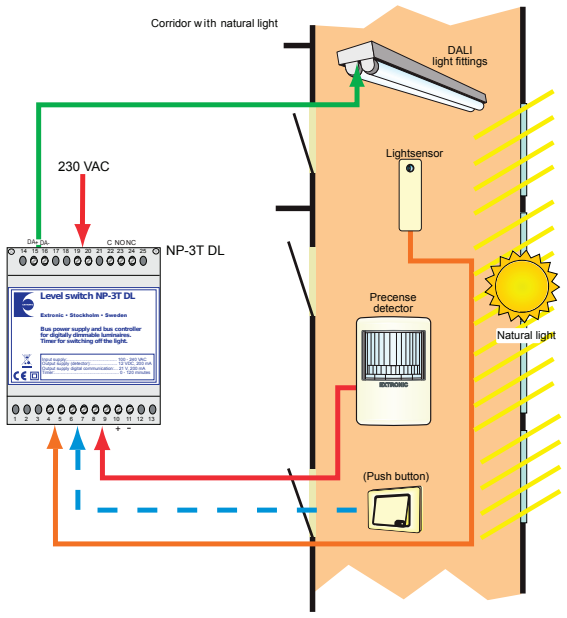
Application examples

A. Premises with light sensor control and automatic on/off switching.



A. Automatic installation, the lighting is switched on when the detector detects presence, and the level of lighting is controlled with the aid of a light sensor.

B. Premises with light sensor control, automatic on/off switching and push buttons for manual on/off switching and dimming.



B. Installation that allows lighting to be switched on/off and ramped up/down by means of one or more push buttons. The lighting level is normally controlled with the aid of a light sensor.

Wiring

NP-3T DL is easily installed on a DIN rack in a standard enclosure. Underneath the label is a cover that can be opened by lifting the bottom edge. Underneath the cover there are indicator LEDs for the inputs, outputs and adjustment potentiometers.

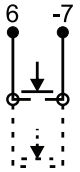
Terminals 4–5, light sensor

The LS-10 light sensor is installed in a location where it will be exposed to daylight, in a window recess for example.
Connect the light sensor to terminals 4 and 5.

Light Sensor LED (green):
- glows steadily when there is sufficient natural light. Prevents lighting from being switched on.
- is unlit when it is dark outside and the lighting is switched on.
- flashes during regulation stage.

Terminals 6–7, pushbuttons

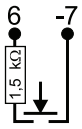
One or more spring-loaded pushbuttons can be connected to terminals 6 and 7 (negative). A closing pulse switches the lighting on or off. If more than one pushbutton is installed they must be connected in parallel.



The Switch LED (yellow) glows steadily when a switch is closed. When a button is held in it ramps the lighting up and down.

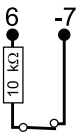
Special configurations for pushbutton:

Ramping up to 100%
When a 1.5 kΩ resistor is connected in series, the lighting can be ramped all the way up to 100 per cent even if the Max light level potentiometer (red) is set to a lower value.

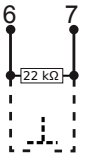


Switching on only
If a 4.7 kΩ resistor is connected in series, the lighting can only be switched on. A single press provides 15 minutes of lighting time without the need for presence to be detected.

Latching switch
When a 10 kΩ resistor is wired in series a switch with latching contacts can be used to turn the lighting on and off.

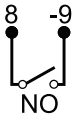


Overriding digital off pulse
If a 22 kΩ resistor is connected in parallel, it prevents the sending of digital off pulses. The relay still opens, however.



Terminals 8–9, detector

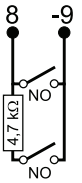
A presence detector (NO contacts) is normally connected so that it short-circuits terminals 8 and 9 (negative) when presence is detected.



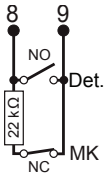
The Det. LED (yellow) glows steadily when presence is detected and flashes when an auxiliary detector detects presence (see below).

Special configurations for detector input:

Detectors that cannot switch lighting on
When a 4.7 kΩ resistor is wired in series, it is possible to connect detectors that will not switch on the lighting, i.e. an AD-350 auxiliary detector that is wired in parallel with the main detector. This resistor can also be added if the lighting is not to be switched on automatically.



NC input for normally closed detector
When a 22 kΩ resistor is wired in series with, for example, a magnetic switch (normally closed, NC) in a door, the lighting can be switched on before presence is detected by the presence detector. The magnetic switch is connected in parallel with the detector and a 22 kΩ resistor is connected in series with the magnetic switch. The fixed delay time is two minutes.



Terminals +10 -11, supply to detectors

12 VDC supply for IR detectors. Up to eight PD-2200 detectors can be supplied with power.

The +12 VDC LED (green) glows steadily when the voltage is above 11 V, and flashes at lower voltages.

Terminals +15 -16, DALI

Output for digital control of DALI light fittings and for driving DALI bus.
The Light LED indicates the lighting output. When it glows steadily the lighting is at maximum brightness, and when it is dark the lighting is switched off. Between these two states, the LED flashes and the length of the pulse indicate the lighting level.
If the supply voltage to NP-3T DL is interrupted the light fittings will be switched to maximum brightness (unless the light fittings are programmed otherwise).

Terminals 19–20, 230 VAC

For connecting 230 VAC supply voltage.

Terminals 22-23-24, relay output

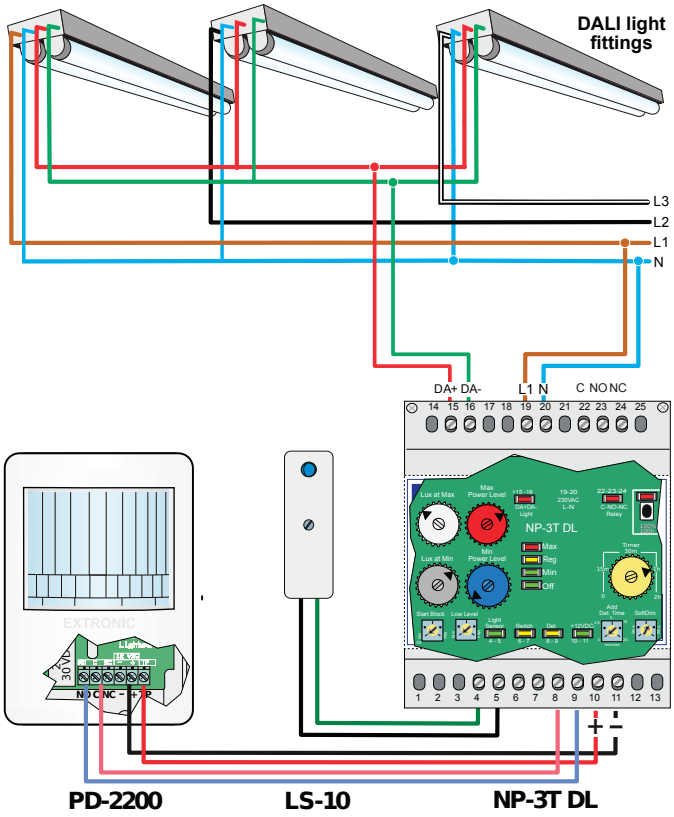
Relay output C-NO-NC.
C (21) is the common terminal for the internal relay.
When the lighting is to be switched on there should be continuity between C and NO.
If NP-3T DL loses its supply voltage, the relay closes and makes contact between C and NO so that the lighting is switched on.

The Relay LED (red) glows steadily when the relay is closed and flashes when the timer is counting down. When the LED is off the relay is not closed.

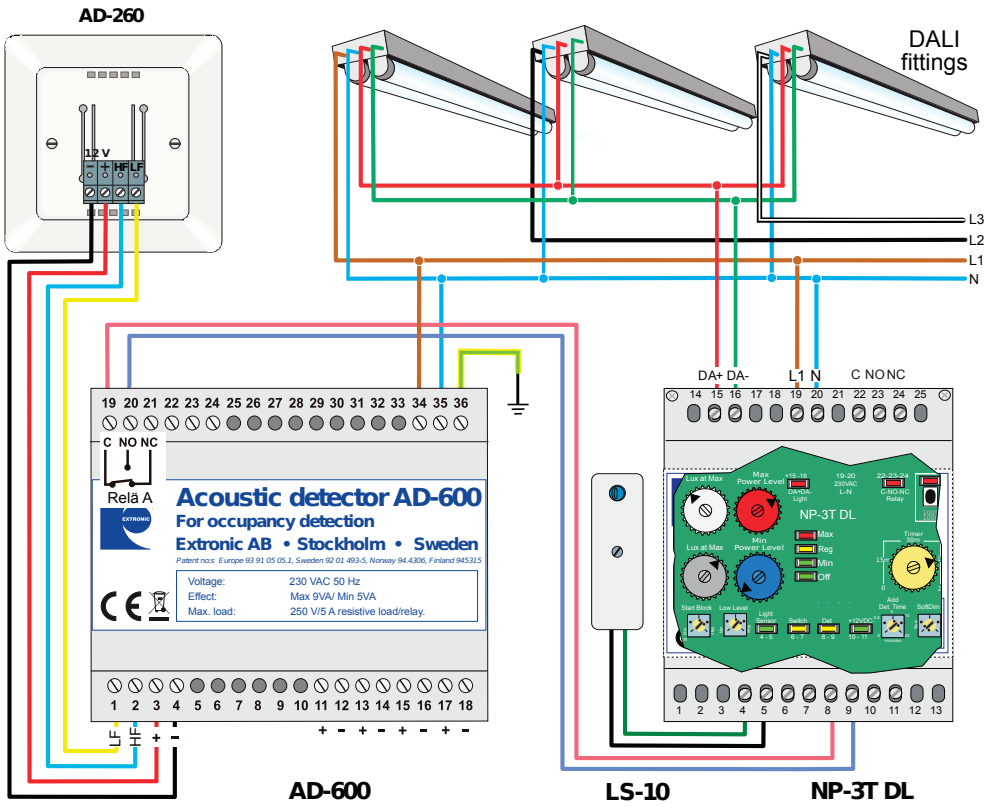
Safety precautions

- Installation of the unit requires connection to a mains voltage supply. Electrical connections must therefore be made by a suitably qualified electrician and the mains supply must be disconnected before installation commences.
- The unit should be installed on a DIN rack in an electrical cabinet or distribution unit.
- The electrical cabinet or distribution unit must be locked or located in a locked area, or must be designed so that it can only be opened with a special tool or by using both hands. Otherwise the unit must be installed at a height of at least 1.7 metres.
- The unit must not be modified or dismantled.
- Repairs and servicing may only be carried out by qualified service personnel.

Wiring example with PD-2200 IR detector



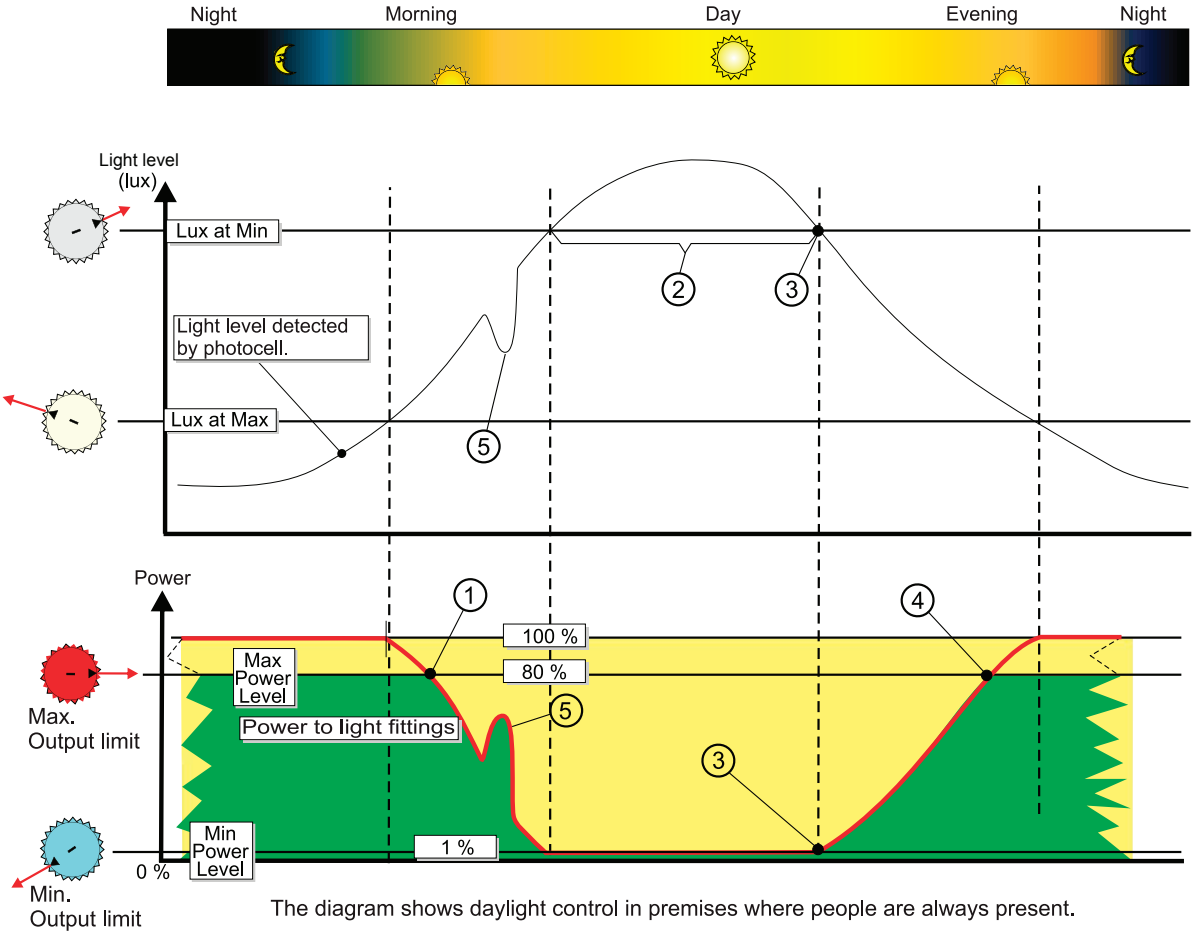
Wiring example with AD-600 acoustic detector



Comfort lighting control / daylight control

The way that comfort lighting control works is explained by the diagram below and the following description:
The light sensor monitors the light level in the premises. The placement of the light sensor is important; see the section on Placement of light sensor.
Comfort lighting control regulates the lighting output (lower curve) so that the light level in the premises is always adjusted to suit the ambient light level (upper curve). The lighting is regulated continuously, so if storm clouds darken the sky for example, the lighting level (power) is increased automatically. A fuzzy logic system is used for regulation.

The lighting is regulated between two adjustable levels (lux values), the max. and min. light levels, which are set using the Lux at Min and Lux at Max potentiometers.
The Lux at Max (evening/night) potentiometer is used to set the light level (lux value) when the lighting is required to operate at maximum power. As the light level increases, the lighting is dimmed and the power is reduced.
The high level (daylight) is set using the Lux at Min potentiometer, and is the light level (lux value) when the lighting is required to operate at minimum power.
The curves in the diagram below show how the light level varies over 24 hours (left curve) and how the lighting (power curve on the right) is affected.



The diagram shows daylight control in premises where people are always present.

1. Light level when lighting is initially dimmed (lighting output is reduced).
2. Light level when lighting is set to minimum output setting.
3. Light level when lighting is initially ramped up.
4. Light level when lighting is set to maximum output setting (80 %)
5. A cloud causes the light level to fall temporarily and so increase the lighting output temporarily.

Indication LEDs

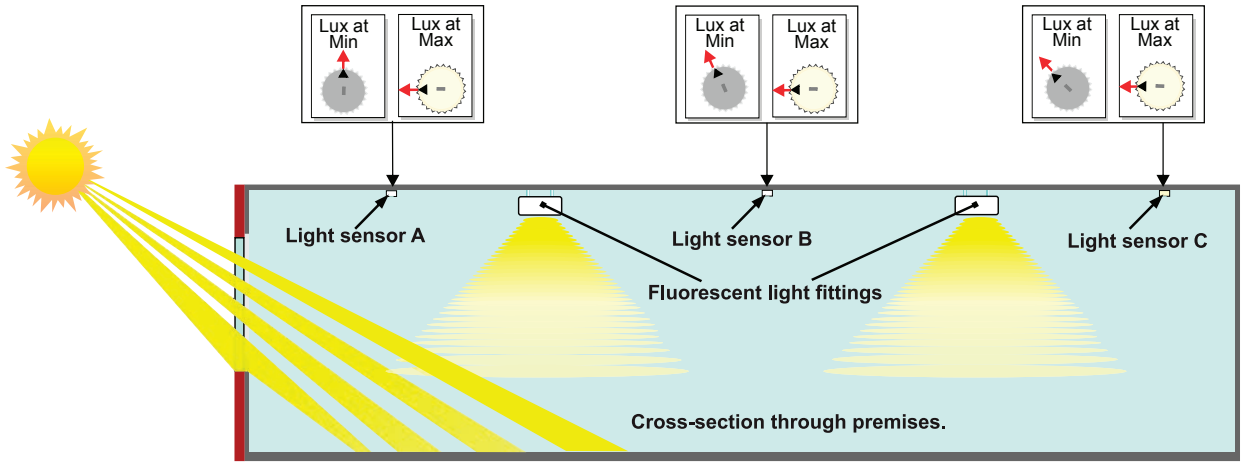
= Off = Flashing = Lit

	Max. Output	Regulating high output	Regulating medium output	Regulating low output	Minimum output
Max					
Reg					
Min					

Placement of light sensor

The light sensor should be positioned so that it can “see” the area of the premises where natural light is coming in.
The light sensor can be positioned further inside the premises, but then the adjustment of the Lux at Max and Lux at Min potentiometers may need to be a little more accurate.
These three light sensor positions and settings for the intended premises should give roughly the same lighting output at the same time of day.

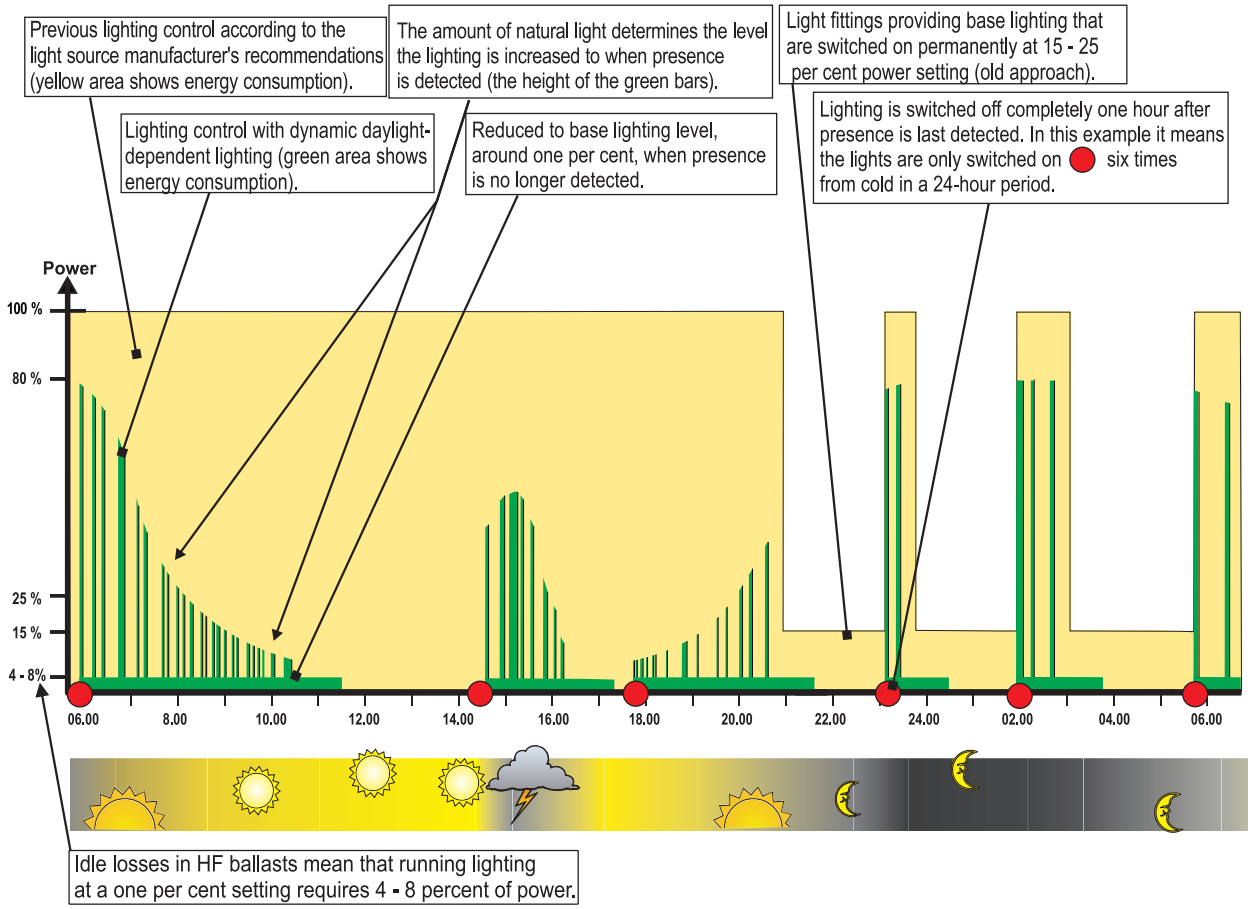
Light sensor A is strongly affected by light from outside. The difference between the Lux at Max and Lux at Min potentiometer settings is greater than for positions B and C.
Light sensor B is considerably affected by light from outside in this case.
Light sensor C is only slightly affected by daylight; there is less difference between the level of daylight and the light produced by the light fittings. With this placement the adjustment of the Lux at Max and Lux at Min potentiometers is a little more important.



Power diagram for premises with varying presence

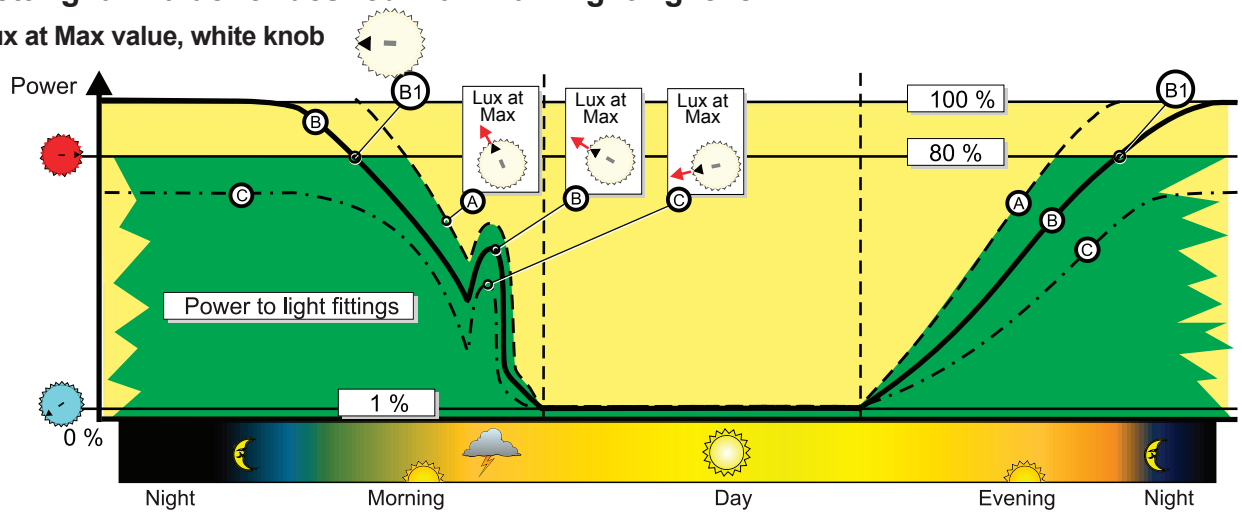
Dynamic daylight-dependent control with NP-3T DL in corridor with plenty of natural light.

The yellow area represents the energy consumption with the old method of lighting control.
The green area represents the energy consumption with the new lighting control system installed



Setting lux value for desired maximum lighting level

Lux at Max value, white knob



The diagram shows daylight control in premises where there is continuous presence.
See also power diagram on page 6, which shows daylight control in premises with varying levels of presence during the day.

The white Lux at Max knob sets the light level (lux value) at which the lighting has to operate at maximum power (high lighting level). The higher lighting level is set by Max Power Level and should be limited to 80%.

A) The Lux at Max knob is set to a relatively high level, which means that the lighting stays at the higher level for longer in the morning and reaches the high level earlier in the evening than with curves B and C.

B) The Lux at Max knob is set to an intermediate value. The lighting will operate at the high level in the morning, evening and at night.

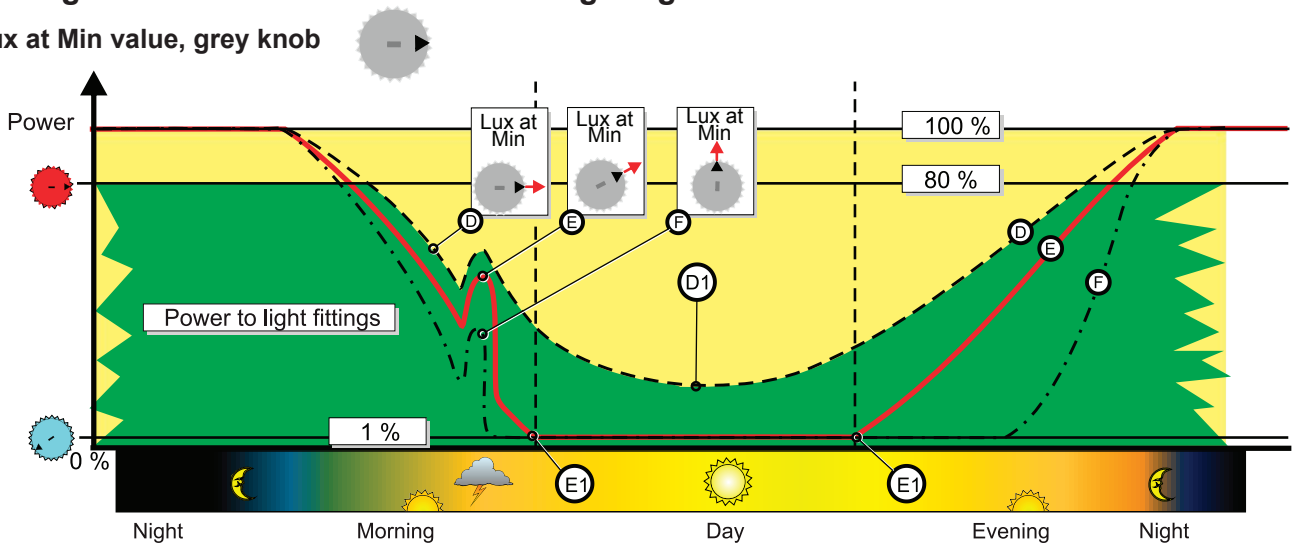
C) If the Lux at Max knob is set at too low a value, the high power level will not be reached (see curve C in diagram).

When setting the Lux at Max value it helps if the Lux at Min setting is a little higher than Lux at Max. If this setting has not already been adjusted, the grey knob can be set temporarily to the two o'clock position.
It is easiest to set the Lux at Max level when it is relatively dark outside and a high lighting level is required (usually 80%), (see point B1 in diagram).

Turn the white knob clockwise until the MAX LED starts to glow, which indicates that the lux level at which the lighting reaches maximum power is set.

Setting lux value for desired minimum lighting level

Lux at Min value, grey knob



The diagram shows daylight control in premises where there is continuous presence.
See also power diagram on page 6, which shows daylight control in premises with varying levels of presence during the day.

The minimum level is set using the grey Lux at Min potentiometer and is the light level (lux value) at which lighting is not required, so the lighting can be switched to its lowest power.
If you do not want the lighting to come on when there is adequate daylight, this level can be set using the Start Block knob. If this feature is not required, turn the knob to the Off position.

D) The Lux at Min knob is turned fully clockwise. When presence is detected the lighting is always switched on, and it is never switched to the minimum power level, D1.
This setting can, for example, be used in premises that do not receive enough sunlight or where the work requires plenty of light.

E) When the natural light is brightest in the middle of the day the lighting is switched to minimum power, E1. This setting is often suitable for stairways or corridors, for example.

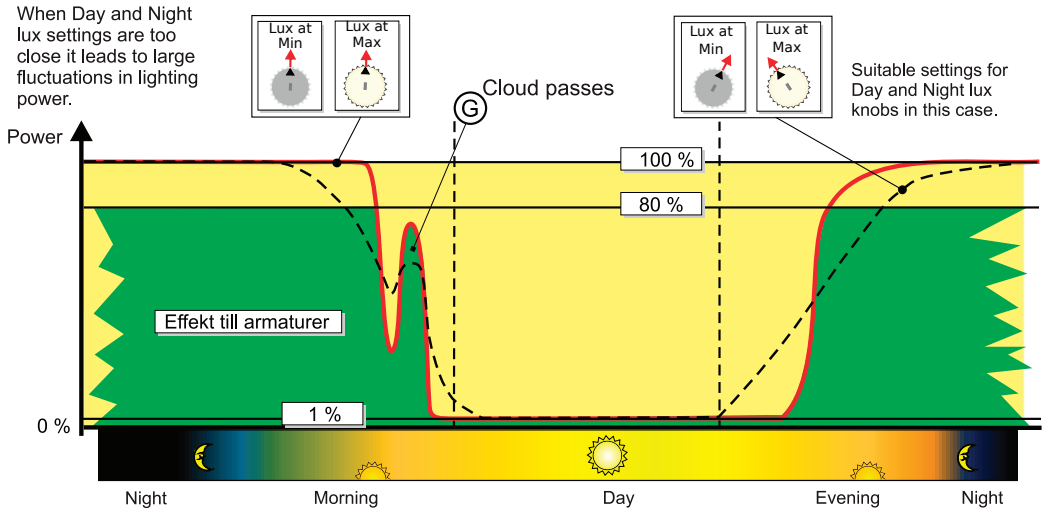
F) The Lux at Min knob is turned fully anticlockwise and the lighting is dimmed to the energy-saving level early in the morning.

It is recommended that the Lux at Min setting is adjusted when it is light enough that you do not really need any lighting (see point E1 in diagram).

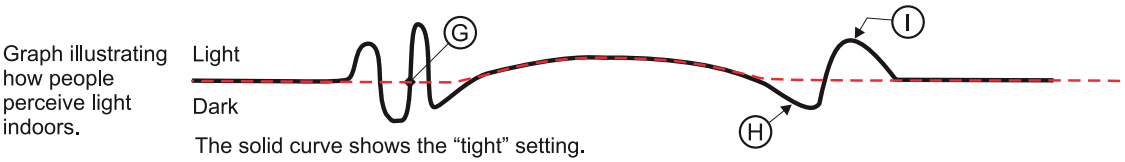
Set this by first turning the grey Lux at Min knob to a high lux value. Then turn it down gradually until the Min LED glows steadily.

It is also possible to set a comfortable level of lighting in the oom when it is fairly light outside, see point D1. This requires that the Lux at Max knob has already been correctly adjusted.

Problems caused by too small a difference between lux potentiometer settings (unstable



The diagram shows daylight control in premises where there is continuous presence. See also power diagram on page 6, which shows daylight control in premises with varying levels of presence during the day.



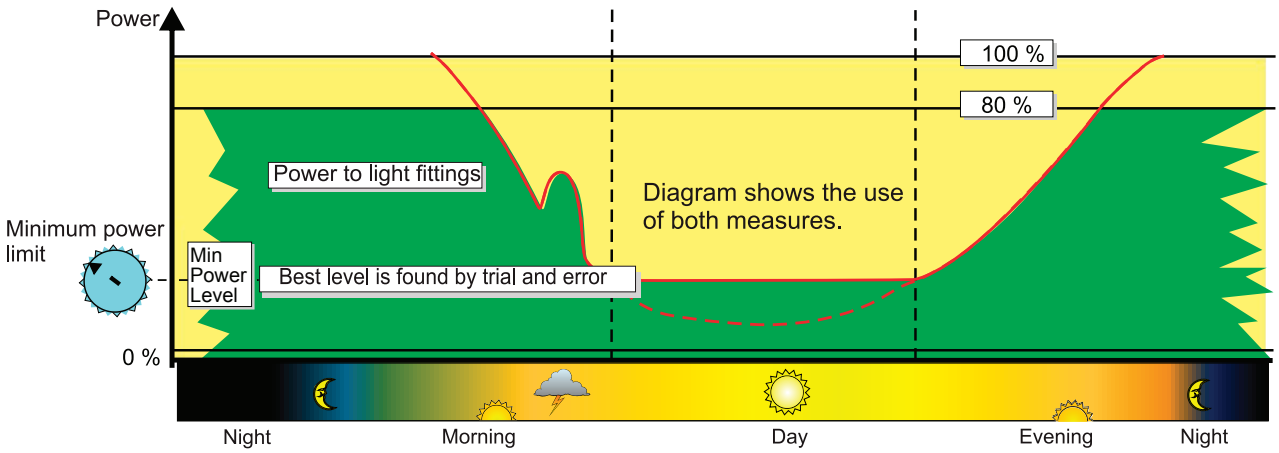
If the Lux at Max and Lux at Min levels are set too close together it can cause a classic regulation problem with continuous fluctuations in light level that are unpleasant.

It can be seen from the power diagram that when a cloud passes, **G**, the light level will change by a large amount.

Towards the afternoon the lighting will appear increasingly gloomy.

When it gets a little darker outside the lighting will quickly be turned up (perhaps over 5–10 minutes) to the highest level **I**. This will be perceived as being very bright.

Other premises may require some lighting during the day as well.



In corridors and stairways there is often sufficient natural light from outside. Other premises may require some lighting during the day as well. Light from outside illuminates from the side, and sunlight also shines on the floor.

If you measure the light intensity with a lux meter it will show that there is sufficient light, but the premises may be perceived as gloomy and unwelcoming.

Two steps can be taken to improve the lighting in the premises:

1. Set the grey Lux at Min knob to a high setting.
2. Increase the setting of the blue Min power level knob.

The image above illustrates the use of both steps.
A pushbutton can also be installed in the premises so that the lighting can be switched on and adjusted manually.

Commissioning

Adjusting levels and times

As a standard solution the lighting level potentiometers should be adjusted as follows:

To make adjustment of light levels easier the relevant level is switched on for a few seconds every time a level potentiometer is adjusted.

Low Level potentiometer – Base level
While the timer is counting down the base level is adjusted to the lowest possible level, often 1–2 per cent.

Blue potentiometer (Min Power Level) – Daylight-dependent, lowest power. Adjust to 1 per cent or to a comfortable lighting level when there is bright daylight.

Red potentiometer (Max Power Level) – Daylight-dependent, highest power. Adjust to a maximum of 80 per cent. A lux meter can be used to adjust this setting.

White potentiometer (Lux at Max) – Light level at which maximum lighting power is required.

Grey potentiometer (Lux at Min) – Light level at which minimum lighting power is required.

Yellow potentiometer (Timer) – Controls the switching on and off of lighting (possibly via a contactor).
This should be set to 1–2 hours (base level). A longer time means that the lighting is switched on fewer times each day.
Longer time = less wear to the cathodes of fluorescent tubes.

Adjust the delay for detector(s) to 1–2 minutes or slightly longer to suit wishes. This time determines how long the lighting remains at the higher level after presence was last detected. This time should therefore be kept as short as possible.
It is very important that the settings for the installation are documented and kept as a record that the adjustment has been carried out according to the instructions.
A form for documenting settings can be found in the Energy-saving Detection Technology handbook and at www.extronic.se/dokumentation/manualer.

Add Det. Time potentiometer – detector delay
The detector's additional delay time is set to the required duration, 0–20 minutes.

Start Block potentiometer – light sensor sensitivity
NOTE! The light sensor should be adjusted so that it prevents the lighting from being switched on when there is sufficient natural light.
1. Turn the potentiometer fully anticlockwise to the Min position.
2. Then turn the potentiometer clockwise until the green Start block LED lights up.
3. Now the lighting will not be switched on until the natural light level falls below the level at the time of setting.
4. **NOTE! The lighting will not be prevented from switching on until presence is no longer detected, the lighting has dimmed to the base level and presence is once again detected.**

Soft Dim potentiometer – Dimming rate
Should be set so that ramping up takes place at the required rate. The ramp down rate is fixed at around 20 seconds. A good base setting is to adjust the potentiometer to the one o'clock position.

Fluorescent tube burn-in. New fluorescent tubes should be burned in to deliver their rated performance Burn-in entails running the tubes at 100 per cent power for 100 hours.

There is a button on the circuit board that starts the burn-in process for fluorescent tubes:
- A single press turns on the fluorescent tubes at 100% for 100 hours.
- Pressing again interrupts the burn-in process.
During the burn-in process the lighting can be switched on or off and dimmed manually.

Technical specification

Voltage:	230 VAC.
Power supply, DALI bus:	21 V, max. 200 mA.
Power supply, detectors:	12 V, max. 200 mA.
Number of light fittings:	Approx. 100 depending on type.
Relay:	Switching.
Switch-off delay:	0–120 minutes.
Dimensions (W x H x D):	72 x 92 x 76 mm (4 modules).

See also application 2H in the Energy-saving Detection Technology handbook and at www.extronic.se.

Optional equipment

PD-2200 presence detector

Order no. 13140, E-no. 13 060 20
PD-2200 is a passive IR detector intended for presence detection. The electronics and software in the microprocessor of the PD- 2200 have been specially designed for presence detection. The number 15 standard lens gives a detection area of 41 m x 41 m.

LS-10 light sensor

Order no. 13100, E-no. 13 060 16
Light sensor for connecting to NV-2T DL, etc. The light sensor monitors the light level in the premises.

AD-500/600 detector

Order no. 13095/13091, E-no. 13 060 10/13 060 12
AD500/600 are acoustic presence detectors for lighting control. These detectors detect presence by listening for sounds in two different frequency ranges and analysing the signals. The lighting is switched on by inaudible low-frequency sound that is generated when a door is opened. The lighting remains on as long as higher frequency sound such as footsteps and speech are detected.

AD-300 acoustic auxiliary detector

Order no. 13126, E-no. 13 060 40
AD-300 is an auxiliary acoustic detector intended for use in combination with an IR detector. The purpose of the detector is to switch on lighting when someone enters the premises by detecting the infrasound (low-frequency sound) that is generated when a door is opened. This improves convenience, by ensuring that lighting is switched on in areas that the IR detector cannot "see", such as concealed doorways.

AD-350 acoustic auxiliary detector

Order no. 13130, E-no. 13 060 41
AD-350 is an auxiliary acoustic detector intended for controlling lighting in combination with an IR detector. It listens solely to a limited frequency range between 3 and 7 kHz and switches on the lighting (or keeps it switched on) when sound is detected in this range, before the IR detector detects presence. The AD-350 is often used to supplement IR detectors, to ensure that lighting remains on when people are present.