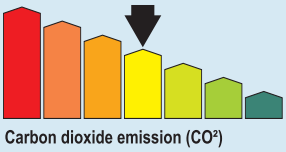
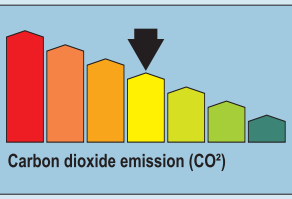
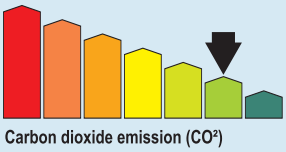
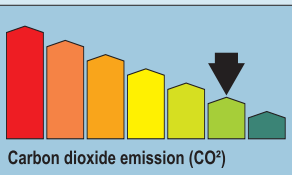
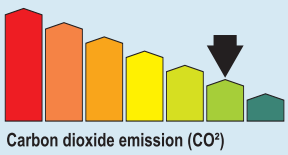
9. Offices and libraries

Premises	Information	Environmental index	Page
9A. Office	Presence detection in office premises with passive IR detection and logic module that is shared by two rooms. 50 Hz light fittings, non-dimmable or dimmable HF ballasts.		142
9B. Library	Combination solution: IR and auxiliary acoustic detectors in area that is difficult to monitor and where movements are small, such as a library. 50 Hz light fittings or non-dimmable ballasts.		144
9C. Large office	Large office with IR detector, Dimmable HF ballasts, daylight-dependent lighting and On/Off logic.		145
Open-plan-offices	See application 11A, which shows an open-plan office with many different types of areas and different systems for presence detection and lighting control.		149

11. Open-plan offices

Premises	Information	Environmental index	Page
11A. Open-plan office	Open-plan office with many different types of areas, hence different systems for presence detection and lighting control.		149

9A. Offices with IR detector

50 Hz, non-dimmable or dimmable HF operating devices

The premises

In office rooms and other small rooms it is usually hard to justify investment in presence-controlled lighting on a purely financial basis. The investment cost of existing technology is too high in relation to the possible reduced energy consumption (saving). Detection in this type of premises uses IR detectors equipped with a high-resolution lens. To improve the results and increase the saving, wall sockets can also be connected to the presence control. This means that fittings for desk lights, point lighting, monitors etc. can be presence-controlled.

NB: If the office room is planned with fittings with built-in presence detectors, the opportunity of presence-controlled wall sockets will be missed.

Other benefits such as environmental and convenience benefits can often be entered in a "calculation", which can lead to justification of the investment. Future increased energy prices and more advanced and cheaper technology can also make it profitable to invest in presence-controlled lighting in office rooms.

Light sources

The fittings can use conventional 50 Hz operating devices or dimmable HF operating devices. In the latter case the lighting can be dimmed manually using a separate potentiometer that does not affect the presence control.

Control

In an installation for presence control of the lighting the user must be able to determine when the lighting is switched on. This requires a logic module (EX-11) that blocks the IR detector upon entry into the room. It is not energy-efficient to impose lighting on people every time they enter the room.

One will often only want local lighting of an area, or the natural light entering may be sufficient. Using a strap the EX-11 can be programmed for two separate areas with a lighting group in each. In this example the strap in the EX-11 must be in the "Two Areas" mode.

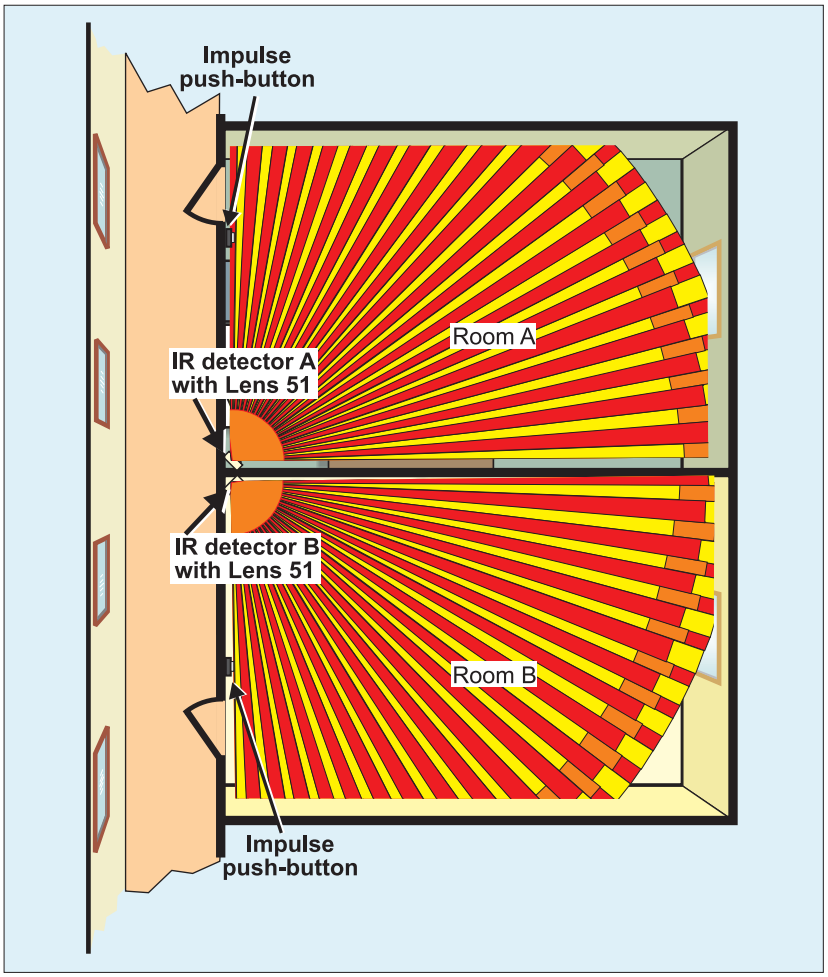
The lighting is switched on and off using impulse push-buttons in the normal manner. However, if one forgets to switch off, the detector takes over and switches off when the room is empty.

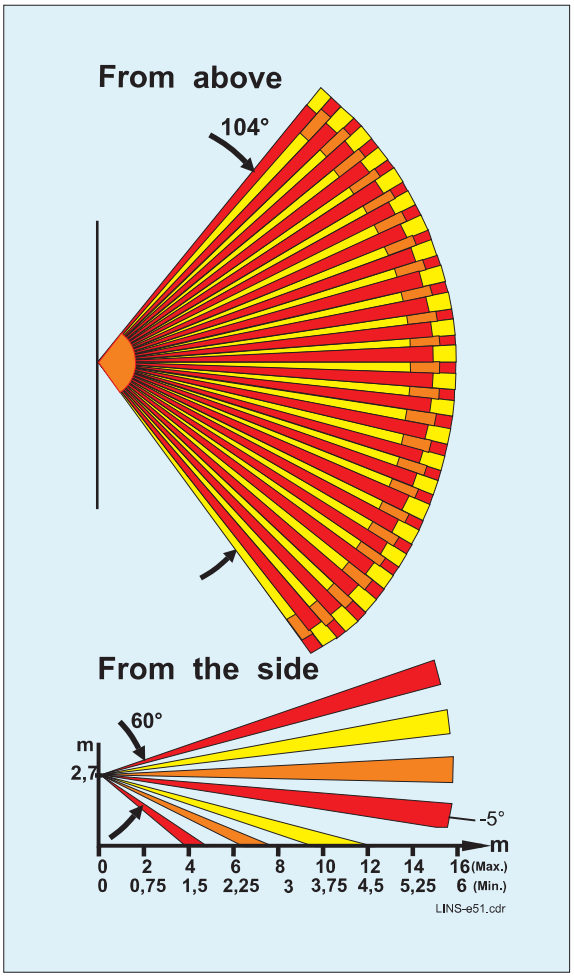
If dimmable fittings are used the lighting can be dimmed manually using a potentiometer in each room. The simplest solution is analogue fittings using 1 - 10 V regulation.

Positioning of the detector

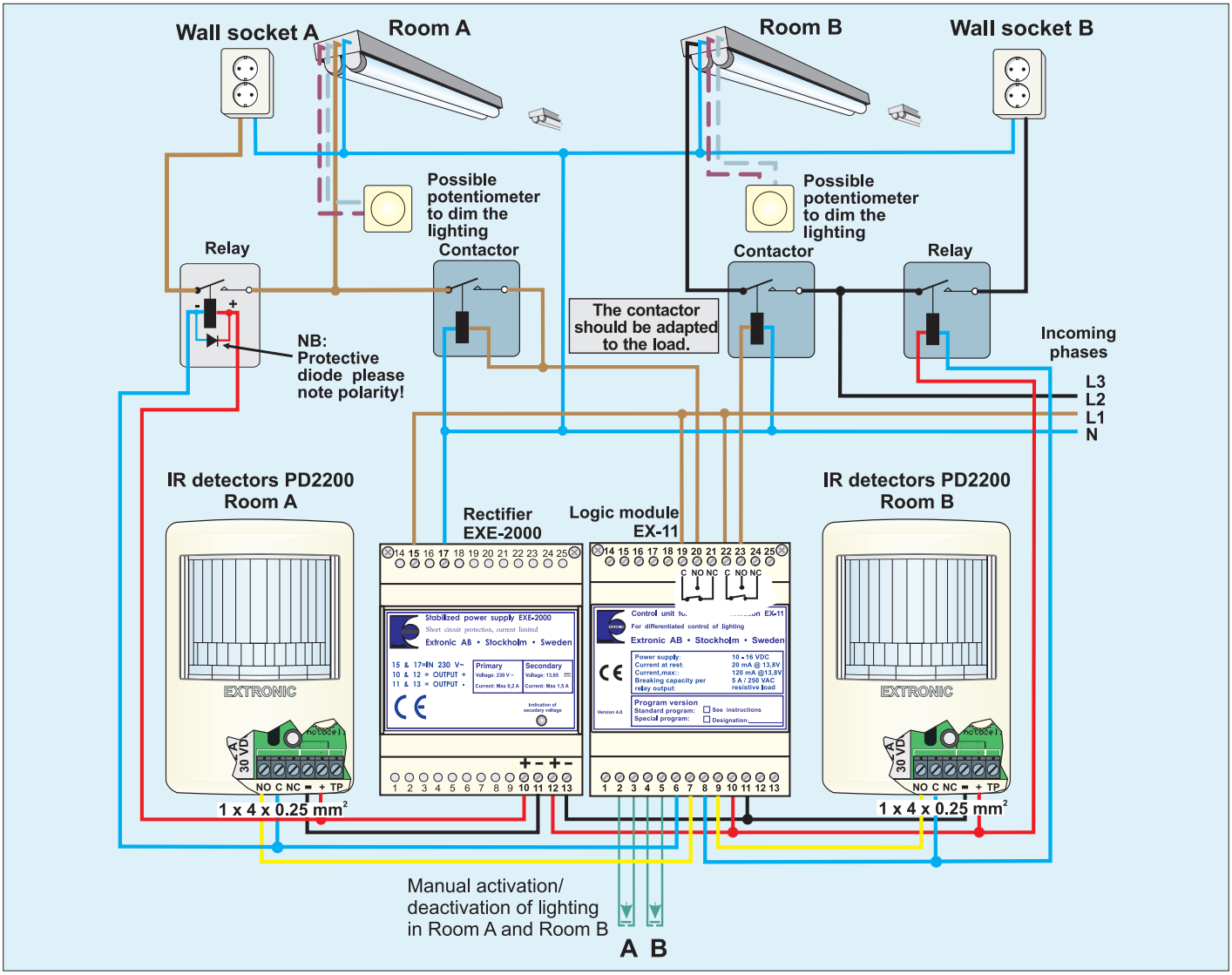
To achieve the optimum direction of detection and avoid the detector looking out through the door, the ideal positioning is in accordance with the design below. The mounting height must be 1.8 - 2.0 m.

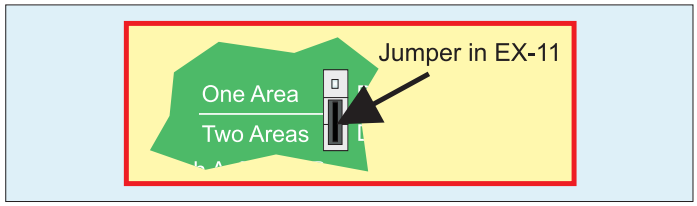
It is also important to select a lens with as many fields of detection as possible, and for them to be as dense as possible. For areas involving sedentary work we recommend Lens 51 in the lens library for the PD-2200.





9A





Product	Order No.
IR detector PD-2200 2 ea.	13140
Logic module EX-11	13161
Rectifier EXE-2000	18108
Relay 2 ea.	20470
Base 2 ea.	20475
Lins 51	13031 + Lens No.

Options	Order No.
Dimmer with maximum level limit	13172

Information for current budget

Product	Maximum current consumption (mA)
IR detector PD-2200	25
Logicmodule EX-11	120
Single-pole relay	25

9B. Library with IR detector and acoustic auxiliary detectors

50 Hz or non-dimmable HF operating devices

Swedish patent nr. 9201493-5, English patent No. 0659329

The premises

In libraries or similar premises it can be very hard to detect presence using IR detectors because of small movements and screening interior fittings.

Light sources

The fittings can use conventional 50 Hz operating devices or non-dimmable HF operating devices.

Control system

In this type of premises IR detection using Special Lens 51 from the lens library is used. It provides the maximum possible resolution and the capacity to detect small movements. Lighting is switched when presence is detected by an IR detector, which should be placed so that it detects entrance into the premises.

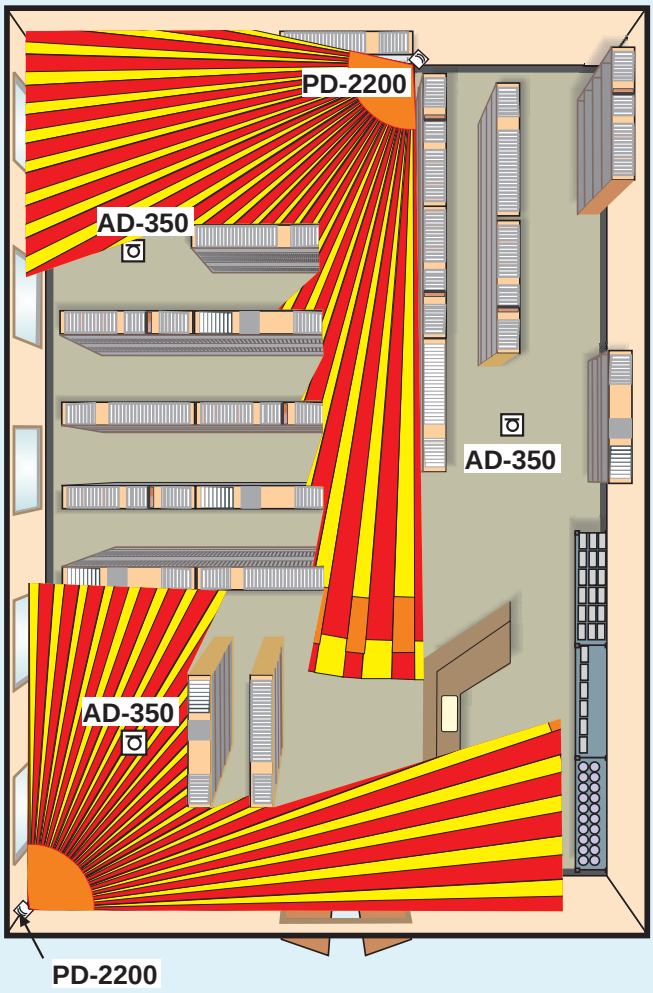
Detection is considerably simplified by the AD-350 acoustic detector, which listens within a higher frequency range and registers the sound of people's steps, "S" sounds, rustling paper etc.

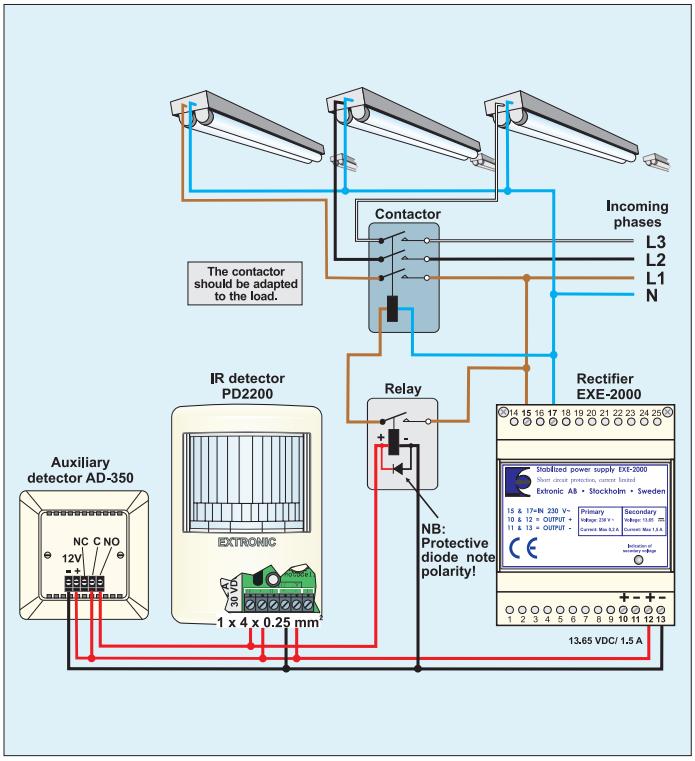
The AD-350 thus complements the IR detector in environments where sedentary people must be detected and in areas where detectors cannot detect presence because of the interior fittings in this case bookcases.
The AD-350 thus complements the IR detector in this example from a library.

Upon each influence by the acoustic or IR detector, the time the lighting is switched on is extended by the delay period set in the relevant detector. Both detectors are connected to an auxiliary relay against load or contactor, to avoid 230 VAC entering the detectors.

NB: In applications that use a PD2200 detector, where people work at desks and do not move much, it is important that the detector mode jumper is set to the "Low/Office" position

Example: library reading corner





Product	Order No.
Auxiliary detector AD-350	13030
IR detector PD-2200	13140
Rectifire EXE-2000	18108
Single-pole relay	20470
Base	20475
Contactor	20480
Lens 51	13031 + Lens No.

Information for current budget

Product	Maximum current consumption (mA)
Auxiliary detector AD-350	35
IR detector PD-2200	25
Single-pole relay	25

9C. Large office with IR detector

Dimmable HF ballasts, daylight-dependent lighting and On/Off logic.

The premises

In office rooms and other small rooms it is usually hard to justify investment in presence-controlled lighting on a purely financial basis. The investment cost of existing technology is too high in relation to the possible reduced energy consumption (saving). Detection in this type of premises uses IR detectors equipped with a high-resolution lens. To improve the results and increase the saving, wall sockets can also be connected to the presence control. This means that fittings for desk lights, point lighting, monitors etc. can be presence-controlled.

Other benefits such as environmental and convenience benefits can often be entered in a 'calculation', which can lead to justification of the investment. Future increased energy prices and more advanced and cheaper technology can also make it profitable to invest in presence-controlled lighting in office rooms.

In offices it must be possible to switch on lighting when needed (room has natural lighting from windows) and switch lighting off when leaving the room. When special activities take place it should be possible to dim the lighting manually to the required level. It would be an infringement of personal freedom to set a light level that cannot be changed. Different people have different lighting needs for different activities. NV-3TR provides the possibility to regulate the light level manually.
The premises have large windows and let in a large amount of natural light. A ***dynamic*** daylight-dependent ***lighting*** system is therefore installed. This allows the lighting level to adjust automatically to suit the natural light and the way that the premises are used. When presence is detected, the lighting level is increased gradually from the base lighting level of around one per cent to a level that is determined by the amount of natural light entering the room.

Light sources

The light fittings have dimmable HF ballasts with analogue control (1–10 V).

Detector placement

An IR detector with a number 51 lens is used in office space. This gives the maximum possible resolution and hence the ability to detect small movements.
The placement of the detector is critical to performance! The illustration below shows how the detector should be positioned. When combined with **lens no. 51**, which permits higher installation, this enables optimum detection on entry. In addition, the detector cannot see out through the door, which means that the lighting does not remain switched on when people pass by in the corridor outside.

Product	Order No.
IR detector PD-2200	13140
NV-3TR	13170
Light sensor LS-10	13100
Rectifire EXE-2000	18108
Lens 51	13031 + Lens No.

Information for current budget

Product	Maximum current consumption (mA)
IR detector PD-2200	25
Level selector NV-3TR	45

Control system

To exploit the hidden savings potential available in all areas that have natural lighting, the installation should include an on/off logic module that prevents the lighting from being switched on when someone enters. All activities may not require artificial lighting in addition to the available natural light, so personal needs should decide when lighting is switched on. This means that the lighting is switched on and off in the usual way using a pushbutton. The detector only comes into action and dims the lighting to the base level (one per cent) after the set time (3–5 min.) when someone forgets to switch a light off. To use this function a 4.7 kohm resistor must be connected between the IR detector and the level selector.

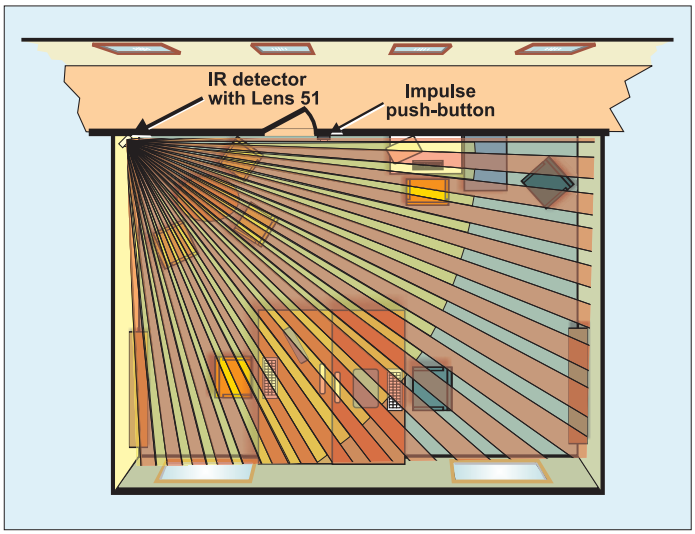
The lighting can be adjusted to suit the natural light (daylight-dependent light) by means of the LS-10 light sensor.

The dimmable light fittings with HF ballasts are regulated by analogue control (1–10 V). The light intensity can also be adjusted manually by holding in the pushbutton.

Whenever the lighting is switched on the system reverts to the set light level for daylight-dependent lighting.

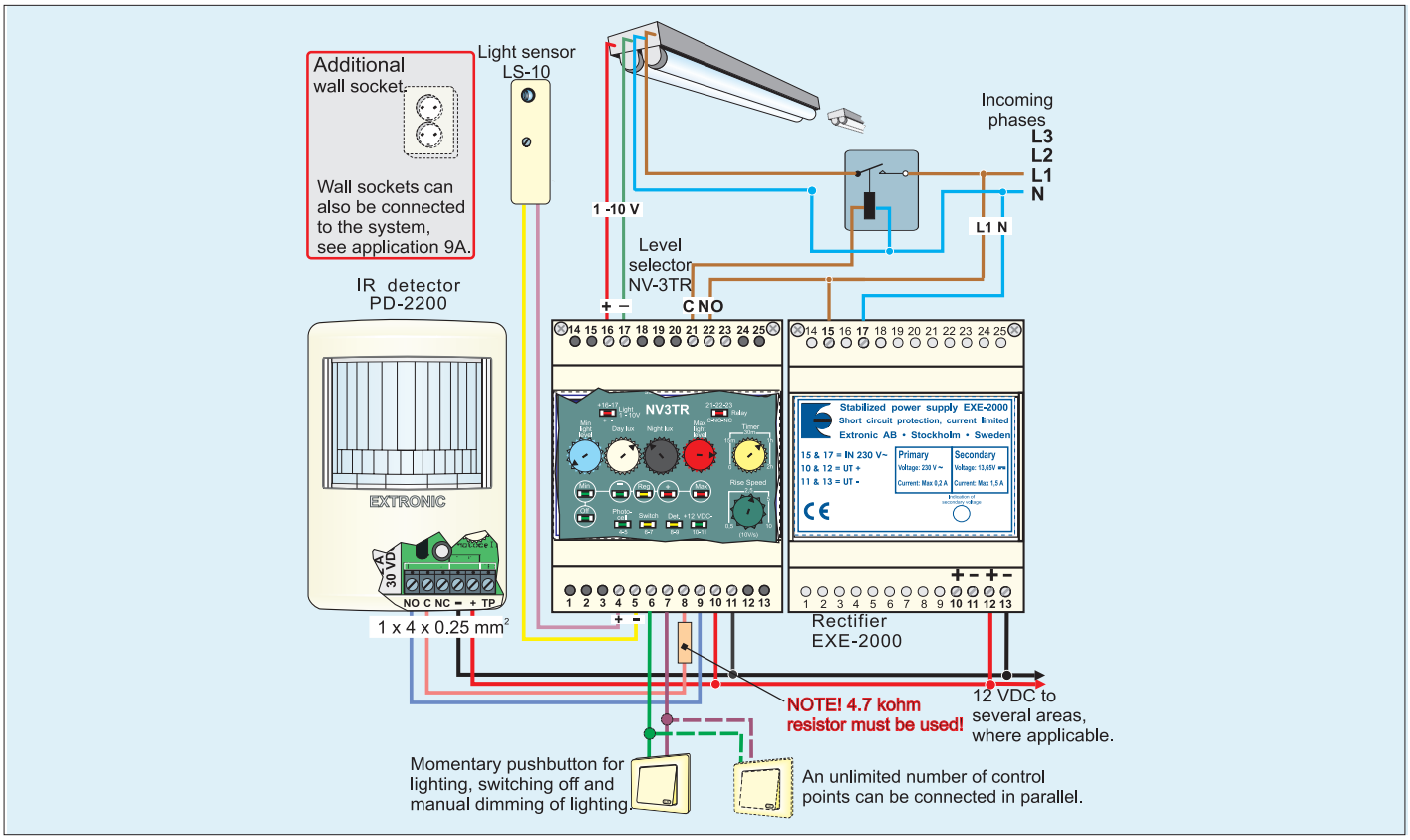
The dynamic system uses light fittings with **dimmable HF ballasts, presence detection, level selection** and a **light sensor**.
Dynamic lighting operates as follows:
When presence is detected the lighting is switched to a maximum level of 80 per cent, depending on the available natural light. One minute after presence is last detected, the lighting is reduced to 1–3 per cent. When someone enters the corridor the lighting is gradually ramped up again to a level that depends on the natural light level, as measured by the photocell (between one and 80 per cent). One hour after presence is last detected the lighting is switched off completely.
The main benefits that are obtained with dynamic lighting control are:

- Possibility of saving 20–99 per cent in operation.
- Lower working temperature of light fittings, with consequent increase in working life.
- The combination of reduced switching, reduced wear to cathodes and lower power levels that reduce wear to the fluorescent coating extends the life of light sources.
- Less need to follow light source manufacturer's recommended burn times, drastically reducing run times and increasing savings.

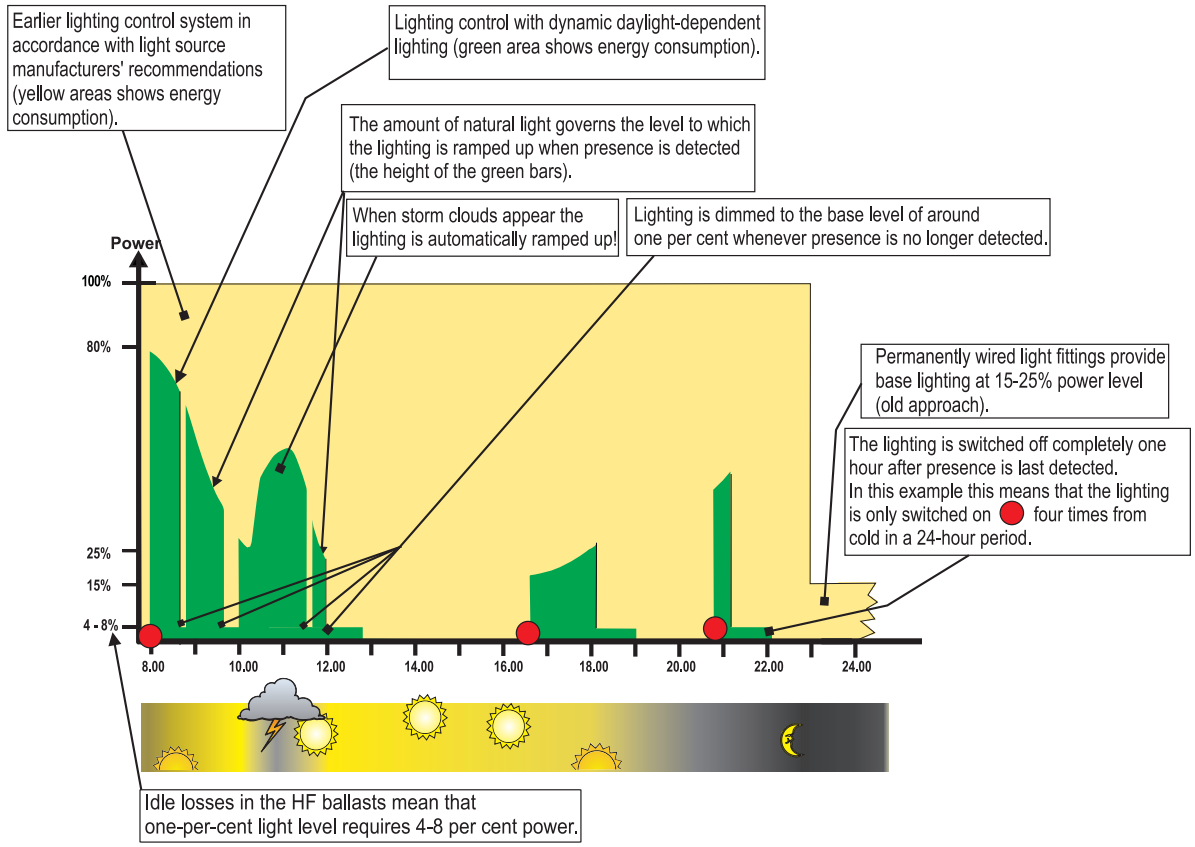


9C

Wiring diagram for daylight-dependent office lighting, with IR detector to provide presence detection.



Dynamic daylight-dependent lighting control with NV-3TR in office with plenty of natural light.



10B. Divided engineering premises

Different types of premises with different systems for presence detection and lighting control.

Premises

The example shows engineering premises that are divided up for different activities. There is a warehouse for production (1) and a workshop with a three-shift system and partially automated manufacturing (4). The third area is large and is used during the day shift as a service workshop and for the manual building of prototypes. The service workshop (2) is used frequently throughout the day, while the prototype workshop (3) is used sporadically and the lighting is only switched on a few times each day.
The lighting in the adjacent stairway is also presence-controlled.

Method of presence detection

1. Warehouse premises with warehouse aisles

Open warehouse aisles with storage or pallet racks. Each aisle is monitored individually by a ceiling-mounted PD-2200 IR detector with lens no. 17. The light fittings in this warehouse have dimmable HF ballasts with analogue control (1–10 V).

See application example 6A
for a detailed description and wiring diagram for “Dynamic lighting control”. The same power supply is used to drive all the systems.

2. Workshop premises that are busy throughout the day

Presence detection is provided by a PD-2200 IR detector with standard lens no. 15. The light fittings have dimmable HF ballasts with analogue control (1–10 V).

See application example 2C
for a detailed description and wiring diagram.

3. Part of the larger premises where there is little activity

Presence detection is provided by a PD-2200 IR detector with standard lens no. 15. The light fittings have older non-dimmable ballasts.

See application example 12B for a detailed description and wiring diagram.

4. Workshop premises with three-shift production

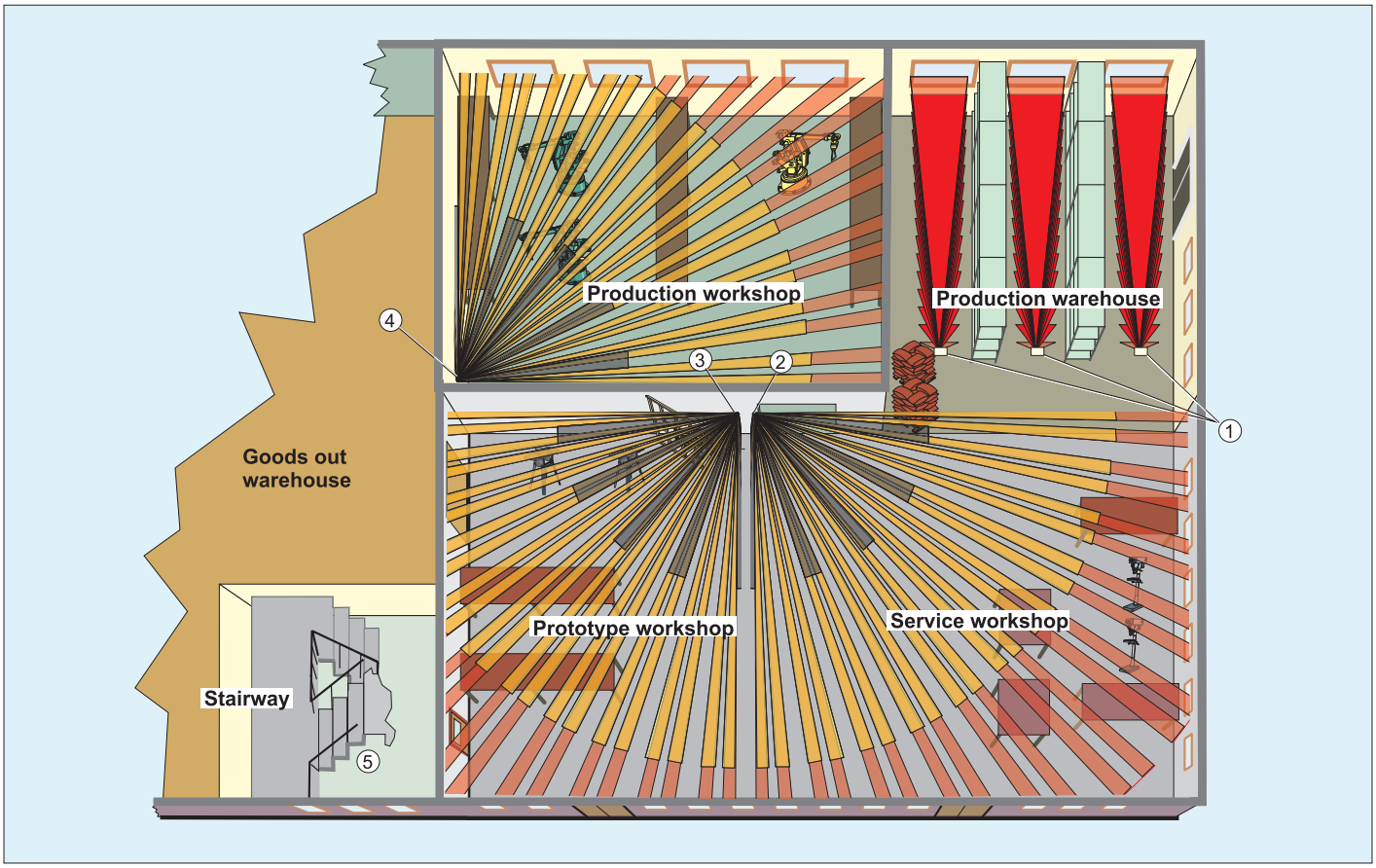
Presence detection is provided by a PD-2200 IR detector with standard lens no. 15. The light fittings have dimmable HF ballasts with analogue control (1–10 V) and are part of a “Dynamic lighting control” system.

See application example 2C for a detailed description and wiring diagram.

5. Stairway over four flours

Presence is detected here by an AD-600 acoustic detector and AD-260 microphone. The light fittings have dimmable HF ballasts with analogue control (1–10 V).

See application example 4B for a detailed description and wiring diagram.



11A. Open-plan offices

Open-plan offices include many different types of premises and hence require different systems for presence detection and lighting control.

Swedish patent nr. 9201493-5, English patent No. 0659329

Premises

1A & B. Open-plan offices.

Presence in open-plan offices is detected with a PD-2200 IR detector with 51 lens. The lenses are masked and the detectors are aimed so that only the chosen area is watched. Lenses are masked using a special tape. The sensitivity of the detector can also be turned down, which has the effect of reducing the detection area.

1A. Open-plan office with daylight illumination.

In this case the lighting must be switched on manually with a pushbutton in the usual way when required. This allows the hidden savings potential to be exploited, since lighting is only switched on when additional light is required. When no one is present the lighting is switched off automatically. This function is achieved using the EX-11 logic module. The light fittings in the area are divided into two groups that are controlled individually by separate IR detectors via one EX-11. This means that if people are only present in one half of the area, only this half is illuminated. **For wiring, see application 3A.**

1B. Open-plan office with little or no daylight illumination.

In this area, which has little or no natural light, the lighting is switched on automatically when presence is detected. However there is also the option to switch on or off each light fitting manually using a pull switch. When no one is present the lighting is switched off automatically. In an open-plan office or parts of an open-plan office, where detection by IR detector is poor, for example due to partitions, shelves or other furniture that masks the detector, an AD-350 auxiliary acoustic detector can be used. This detects high-frequency sound (such as footsteps, rustling paper or speech) and ensures that the lighting remains on. AD-350 is activated when the IR detector has detected presence. AD-350 can be wired so that it only controls a single lighting group. For wiring, **see applications 2A** and **10A (AD-350).**

2A & B. Small, narrow open-plan offices.

Detection is by means of a downward-looking ceiling-mounted PD-2200 with 51 lens. The size of the detection area depends on the ceiling height (installation height). In these premises we have calculated an installation height of 2.7 m. This gives a detection area around 3.1 x 7.2 m in size with 51 lens. **See application 6C** for information on how big the detection area will be with PD-2200 and 51 lens for different installation heights.

Take care when using ceiling detectors, their sensitivity varies widely from manufacturer to manufacturer! See "Performance comparison" under "Other information" in the "Planning Guide".

2A. Narrow open-plan office with daylight illumination.

Lighting is switched on manually with a pushbutton in the usual way when required. This allows the hidden savings potential to be exploited, since lighting is only switched on when additional light is required. When no one is present the lighting is switched off automatically. This function is achieved using the EX-11 logic module. The light fittings in the area are divided into two groups that are controlled individually by separate IR detectors via one EX-11. This means that if people are only present in one half of the area, only this half is illuminated. **For wiring, see application 3A.**

2B. Narrow open-plan office with little or no daylight illumination.

Same function as area 1B described above. **For wiring, see application 2A.**

3. Aisles that are open at the sides.

Note that detection only covers movement in the aisle. Detection is by means of a PD-2200 IR detector with 17 lens, which is installed flat against the ceiling at 45 degrees to the vertical. **See application 2F** which shows how the detector should be installed.

One detector is capable of watching aisles that are up to 50 m long. In aisles that are up to 100 m long, two detectors are used, one at each end facing each other. In aisles that are over 100 m long, additional detectors must be installed.

The aisles in this example are used very frequently during certain periods, so a **dynamic lighting control** installation should be chosen. This entails the use of **dimmable HF ballasts, presence detectors** and **level selectors**.

"Dynamic lighting control" works as follows:

When people are present the lighting is set to around 80 per cent. When no presence is detected for 15 - 60 seconds, the lighting level is reduced to around 2 per cent. When someone enters the corridor the level is immediately increased to 80 per cent. When no one has been present for 1 - 2 hours (adjustable) the lighting is switched off completely.

It is also possible to connect an **SD-1** module to increase lighting **gently and slowly**. This means that the lighting is turned up slowly when switching from a low lighting level to a higher level. A potentiometer is used to adjust the time it takes to reach maximum level. The order number for SD-1 is 13173.
See application 2F for a more detailed description of the control system.

4. Photocopier rooms.

This room is visited sporadically and visitors are relatively mobile. Detection is by means of a ceiling-mounted IR detector with 360 degree detection area.

The system is fully automated and the lighting is switched on whenever someone enters the photocopying room and is switched off after the set delay when the room is empty.

Do not use this ceiling detector for stationary work at desks!

See "Performance comparison" under "Other information" in the "Planning Guide". For wiring, see application 6D.

5. Coffee rooms.

Presence in a coffee room is detected with a PD-2200 IR detector with 51 lens. The lenses are masked and the detectors are aimed so that only the chosen area is watched. Lenses are masked using a special tape. The sensitivity of the detector can also be turned down, which has the effect of reducing the detection area.
In this room, which has large windows and is not intended for work, the light sensor in the IR detector is used. The light sensor prevents the lighting from being switched on if the natural light level exceeds the set value. When the natural light is insufficient the lighting is switched on automatically when someone enters the coffee room. When no one is present the lighting is switched off automatically.
For wiring, see application 3A.

6. Meeting rooms.

Presence in the meeting room is detected by a PD-2200 IR detector with 51 lens.

To exploit the hidden savings potential available in all areas that have natural lighting, the installation should include an on/off logic module that prevents the lighting from being switched on when someone enters. All activities may not require more lighting than the available natural light, so personal needs should decide when lighting is switched on. This means that the lighting is switched on and off in the usual way using a pushbutton. The detector only comes into action when someone forgets to switch a light off.

This situation uses a control system with EX-13 logic module. This can be used to control up to four groups of lighting. The lighting is divided into ceiling lighting, blackboard lighting and spot lighting of interior features. EX-13 also has a separate channel for controlling ventilation. It switches on automatically and switches off after an extra long delay (adjustable) so that the premises can be ventilated after a meeting ends.

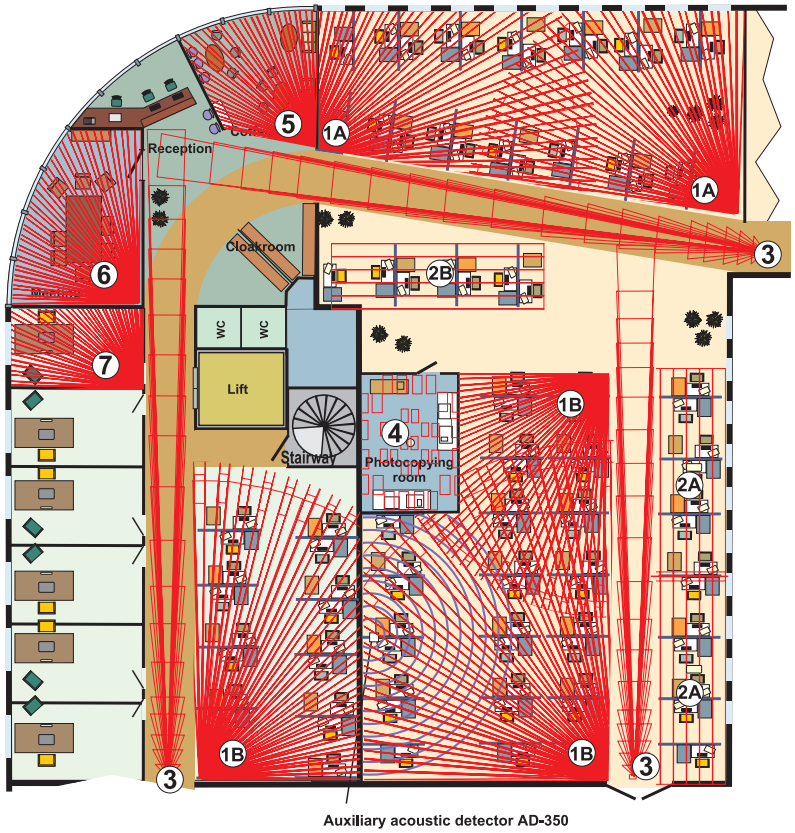
If dimmable light fittings are used, the lighting can be dimmed manually using a potentiometer in each room. The simplest alternative is analogue light fittings with 1 - 10 V control. If a dimmer with a maximum level limit (order no. 13172) is used, a saving of around 80 per cent (adjustable) is possible at full light intensity.
For wiring, see application 3B.

7. Office rooms.

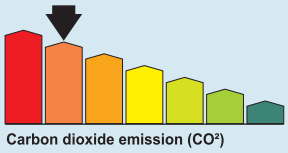
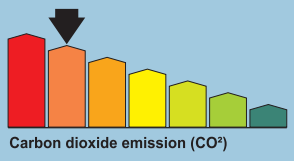
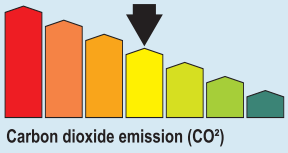
In office rooms and other smaller rooms it is usually difficult to justify an investment in lighting control by presence detection on financial grounds alone. The investment cost using existing technology is too high in relation to the saving that can be made. Often the investment can be justified by including other benefits in the costing, such as environmental savings and comfort improvements. Future rises in energy costs, improvements in technology and falling costs of technology can also make it profitable to invest in lighting control by presence detection in office rooms.

Detection in office rooms is achieved using a PD-2200 IR detector fitted with a high-resolution 52 lens. An EX-11 logic module allows the lighting to be switched on manually and turned off automatically when the room is empty. A single EX-11 can be used to control two office rooms.

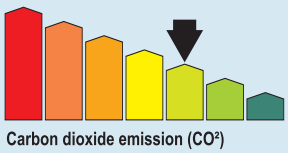
If dimmable light fittings are used the lighting can be dimmed manually using a potentiometer in each room. The simplest alternative is analogue light fittings with 1 - 10 V control. If a dimmer with a maximum level limit (order no. 13172) is used, a saving of around 80 per cent (adjustable) is possible at full light intensity.
For wiring, see application 9A.



12. Other premises without control logic

Premises	Information	Environmental index	Page
12A. Small premises with IR detector	This solution permits simple installation in small existing premises, such as toilets, storerooms, photocopying rooms and other small areas that are used quite frequently. In the case of a new build please see application 12B.	 Carbon dioxide emission (CO^2)	152
12B. Photocopier rooms, storerooms, laundry rooms, etc.	In other premises where there is no need for lighting adjustment or any type of logic control, a simpler system can be used. For connection to 230 VAC. IR detector and 50 Hz non-dimmable, dimmable HF ballasts or incandescent lighting.	 Carbon dioxide emission (CO^2)	153
12C. Premises for various types of mobile activity	This solution is suitable in existing premises for various types of activity, such as recycling, bike stores, storage premises or laundry rooms.	 Carbon dioxide emission (CO^2)	154

13. Air conditioning

Premises	Information	Environmental index	Page
13A. Presence-controlled air conditioning	Presence-controlled air conditioning, possibly in combination with presence-controlled lighting. The system can be used in various types of premises..	 Carbon dioxide emission (CO^2)	155

Other

Premises	Information	Environmental index	Page
PM	Comments on lifetime of light sources in installations with presence control.		157
Alternative connections			159

12A. Small premises with IR detector, e.g. storeroom, archive or recycling room

Incandescent bulb, 50 Hz or non-dimmable HF ballast

Premises

This solution permits easy installation in existing premises. If a solution is required for a new build, please see application 12B.

In small toilets, storerooms, copier rooms and other small rooms, it is often difficult to justify investment in presence-controlled lighting on economic grounds alone. Detection in premises of this type can be provided by an IR detector fitted with a 180° lens, placed where the light switch is normally located.

NOTE! This type of detector and placement should not be used in premises where people work at desks.

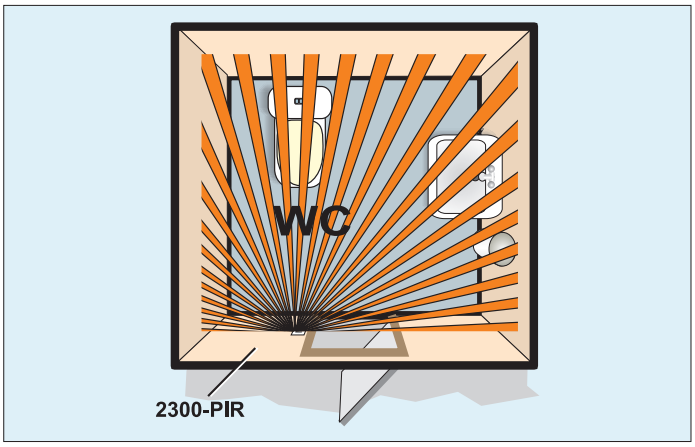
Often environmental benefits and increased convenience can also be included in the costing calculation and help justify the investment. Future rises in energy costs and the development of better and cheaper technology can also make it profitable to invest in presence-controlled lighting in smaller premises.

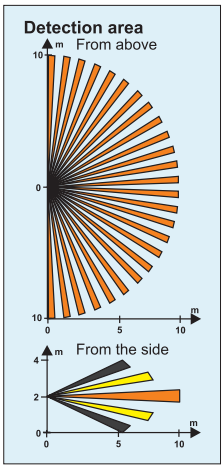
Light sources

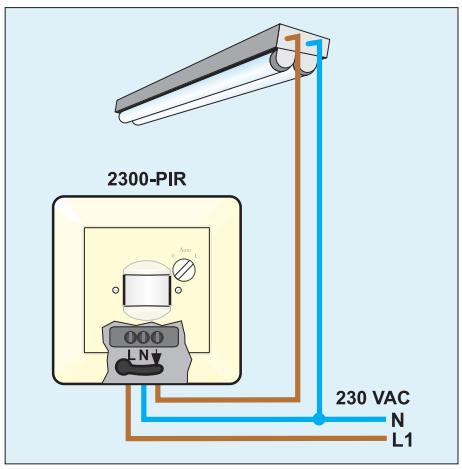
This application shows an example with light fittings that have incandescent bulbs, 50 Hz coil ballasts or non-dimmable HF ballasts.

Detector placement

Several different types of detectors are available for installing in a mounting box in the place of a switch. Unfortunately there is some confusion over the limitations that apply to this type of detector and mounting location.

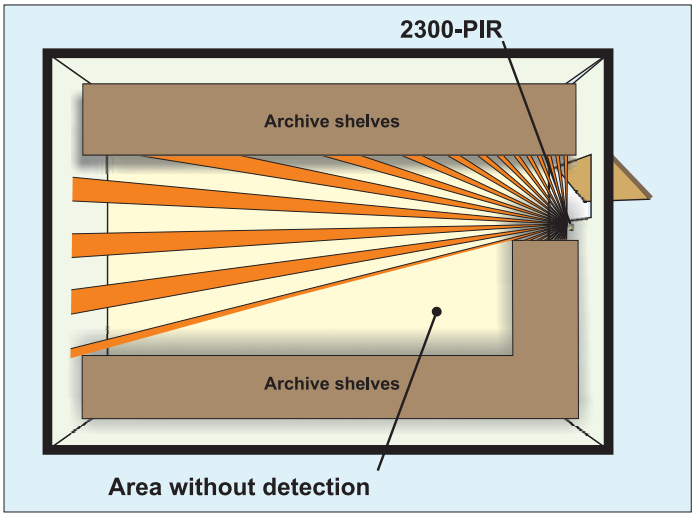






The 2300-PIR detector replaces a switch inside the doorway. This is not the optimum position for a passive IR detector. It is only suitable in certain applications, such as small archives, toilets or copier rooms, where people come and go and large movements are involved. Make sure that the detector is not obscured by furniture or fittings. (See diagram below.)

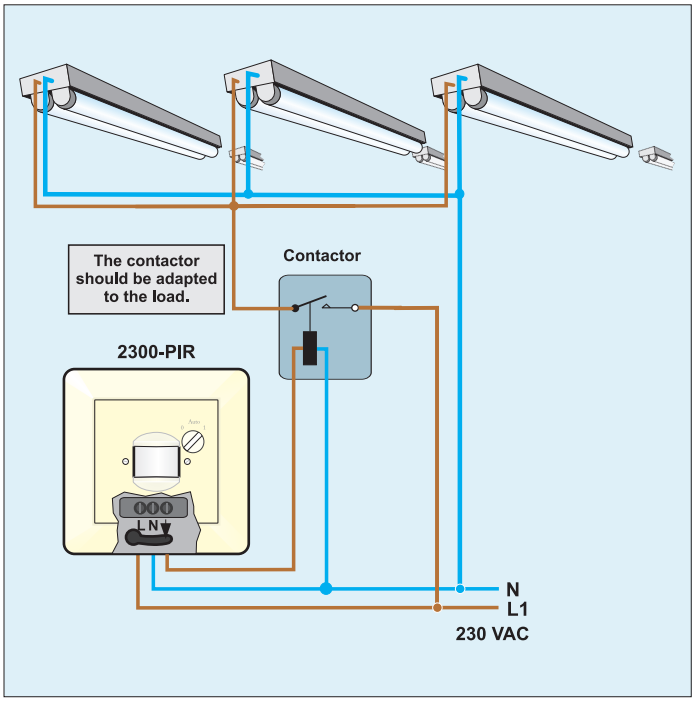
In this example a shelf has been positioned so that it obscures the detector's sensing field!



Control system

The light fittings are connected directly to the detector. Observe the maximum permissible load (2,300 VA incandescent bulb, resistive load) for the detector. No more than two fluorescent light fittings should be connected directly to the detector. Use a contactor for larger loads. See the wiring diagram.

See also applications 9A and 12B for presence-controlled lighting in small premises.



Product	Order No.
Recessed presence detector 2300-PIR	13156
Contactor	20480

12B. Photocopier rooms, storerooms, laundry rooms, etc., with sporadic use

IR detector and 50 Hz, non-dimmable or dimmable HF ballast or incandescent light

Premises

This solution is suitable for new builds. For installations in existing premises please see application 12A.
A simpler system can be used in premises where there is no requirement for lighting level control or control logic. Such a system can be used, for example, in photocopier rooms, small storerooms, refuse rooms, laundry rooms or other small areas that are not used so often.

In this type of area it can sometimes be difficult to justify an investment in lighting control by presence detection on financial grounds alone. The investment cost using existing technology is too high in relation to the saving that can be made. This relatively simple system entails a relatively small investment, which contributes to the shorter payback time, especially if the alternative is that lighting is left on 24 hours a day.

Often it can be easier to justify the investment by including other benefits in the costing, such as environmental savings and comfort improvements. Future rises in energy costs, improvements in technology and falling costs of technology can also make it profitable to invest in lighting control by presence detection in this type of room.

Light sources

Control is achieved by switching off the electrical supply. This means that all types of light fittings can be used, such as light fittings with a 50 Hz coil ballast, HF ballast or incandescent bulbs.

Control

The system is fully automatic, which means that presence is detected by the IR detector when someone enters, and the lighting is switched on. When no one is present the lighting is switched off after a delay set at the detector. In premises with a source of daylight, the built-in light sensor in the IR detector can be used to prevent lighting from being switched on when there is sufficient daylight.

The system is supplied directly with 230 VAC and supplies 230 VAC direct to both resistive and inductive loads up to a maximum rating of 2,300 VA. The control unit that replaces the contactors is mounted on a DIN rack in the electrical distribution panel and is three modules wide. The unit is fused for the connected load, which must not exceed 10 A.

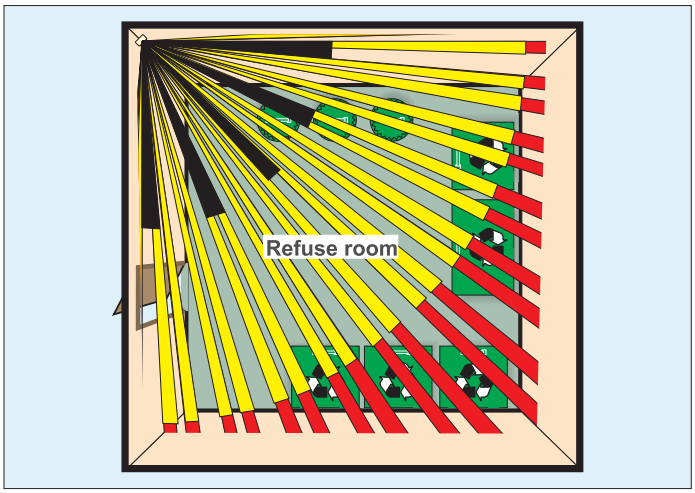
Using a low-current detector that can be supplied by 1 x 4 x 0.25² cable avoids the need to run two 3 x 1.5² cables via the detector. A 12 VDC supply direct from the control unit to the detector is all that is needed, see wiring diagram.

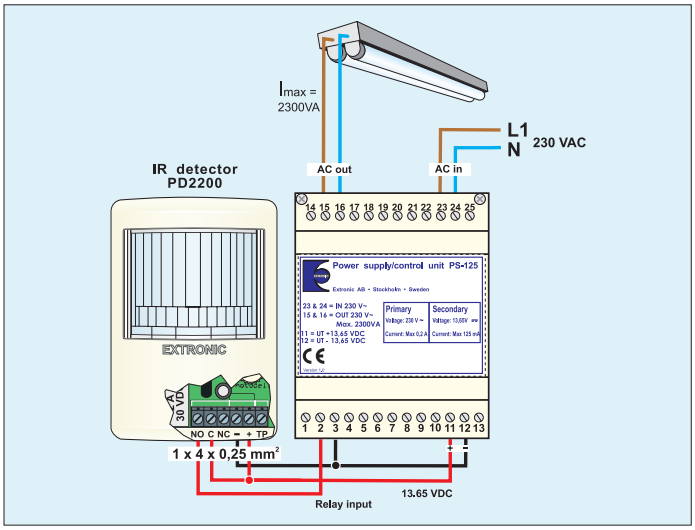
Placement of detector

Placement of the detector is critical to operation! The diagram illustrates how the detector should be placed. In this refuse room a standard number 15 lens is used. The choice of lens will depend on the layout and use of the premises; see the lens library.

The detector is placed so that it cannot see through the doorway, so that the lighting is not switched on when someone passes the door if it has been left open.

The placement of the detector in the corner that is furthest from the door allows the detector to be installed higher up, which reduces the risk of damage. By mounting it in this position the slightly downward-tilted beam reaches the area by the door at a suitable height.





Product	Order No.
PS-125 Power supply with semiconductor relay	18108D
IR detector PD-2200	13140

Information for current budget

Product	Maximum current consumption (mA)
IR detector PD-2200	25

12C. Premises for various types of mobile activity

50 Hz light fittings, non-dimmable HF ballasts or incandescent bulbs

Premises

This solution is suitable in existing premises for various types of activity, such as recycling, bike stores, storage premises or laundry rooms.
In areas where there is no need for lighting control or various types of logic, a simpler system can be used. This may be the case in various types of premises where people **move about**, but which are not used very often.

This relatively simple system entails a low investment cost, which contributes to a shorter payback time, especially if the alternative is that lighting is left on 24 hours a day.

Light sources

This application shows an example of light fittings that have 50 Hz coil ballasts or non-dimmable HF ballasts.

Control systems

The control of light sources with 50 Hz operation and non-dimmable HF ballasts is limited to controlling the supply side, i.e. setting up the detectors to control the contactors. This will lead to increased wear on ballasts and light sources. To minimise this wear, light fittings with coil ballasts should be fitted with electronic starters such as Aura Light “Strike” or an equivalent.

I***n new builds, renovation projects or in premises with frequent movement***, it is very important to study the applications that describe “Dynamic lighting control”. **See applications 2C, 2D and 2E!**

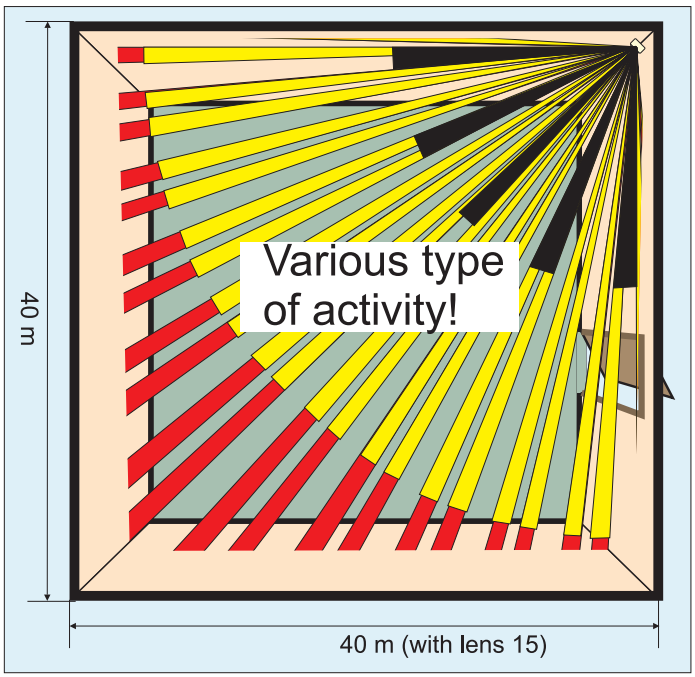
Detector placement

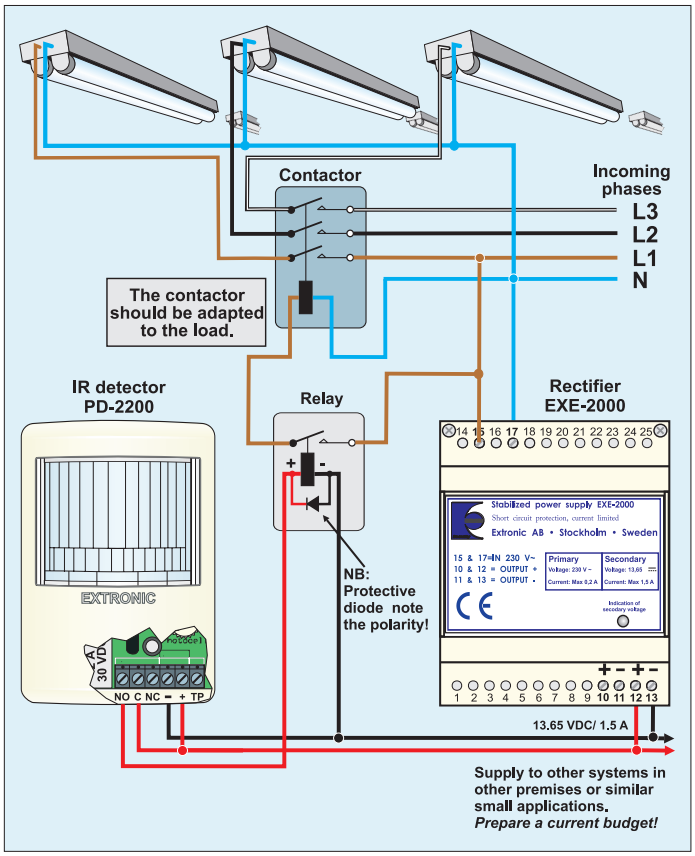
Detector placement is critical to performance! The diagram shows the correct placement of the detector. In this room, measuring up to 40 x 40 m, a standard no. 15 lens is used. The choice of lens must be adapted to suit the layout and use of the premises, i.e. for stationary work a no. 15 lens should be used, see the lens library. The detector is placed so that it cannot see out through the doorway, to ensure that the lighting is not switched on when someone passes by outside when the door has been left open.
Placing the detector in the corner that is furthest from the door allows the detector to be installed higher up, which reduces the risk of tampering. When installed in this way the slightly down-tilted detection fields reach the door at the correct height.

Power supply

The EXE-2000 rectifier can power up to 25 installations of this type.

Prepare a current budget!





Product	Order No.
IR detector PD-2200	13140
Rectifier EXE-2000	18108
Single-pole relay	20470
Base	20475
Contactor	20480
Lins 41	13031 + Lens No.

Information for current budget

Product	Maximum current consumption (mA)
IR detector PD-2200	25
Single-pole relay	25

13A. Presence-controlled air conditioning

Can be combined with presence-controlled lighting

Premises

In many different types of premises it can be profitable to use presence detection to control air conditioning, since more energy is required to remove excess heat than to heat premises by the corresponding degree. This example shows a conference room, but presence detection can be used to control air conditioning in many different types of premises.

When someone is present in the conference room the air conditioning runs normally and provides comfort cooling. When the premises are empty and no presence is detected the air conditioning is switched to a lower setting that just provides base cooling.

Combining with lighting control

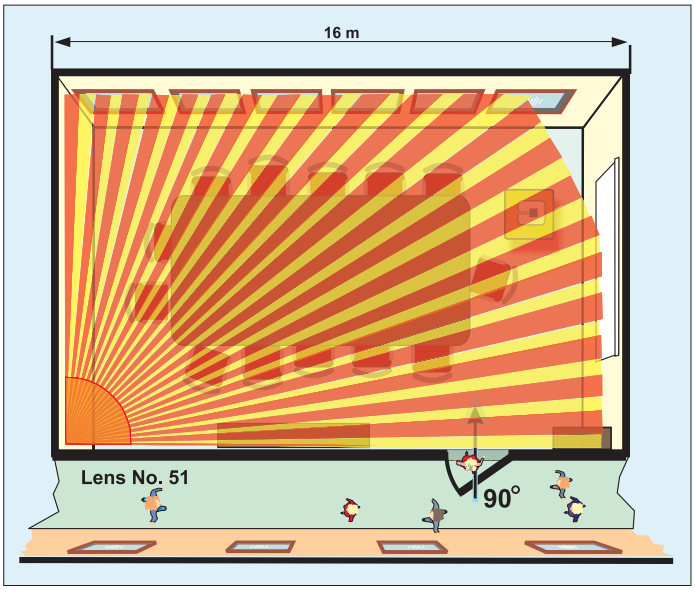
Lighting can also be controlled by the same detector as part of the same system. This example shows a system where lighting is controlled using four levels or lighting groups together with presence-controlled air conditioning. Lighting can be switched on and off manually with pushbuttons, as normal, but if no one switches off the lighting it is switched off automatically when the premises are empty. (Lighting can also be set to switch on automatically, but this is not recommended.) The air conditioning is controlled automatically by presence detection.

Light sources

Light fittings can be fitted with conventional 50 Hz ballasts, non-dimmable or dimmable HF ballasts. In the latter case the lighting can be dimmed manually using a separate potentiometer that does not affect presence-controlled operation.

Detector placement

The placement of the detector is critical to operation! The diagram below shows where the detector should be positioned. In combination with a 51 lens, which permits installation higher up, this gives optimum detection on entry. It also means that the detector cannot see out through an open door, so the air conditioning is not switched on or left at the comfort setting when people pass in the corridor outside.



Placement of the detector in the corner that is furthest from the door means that the detector can be installed higher up, which reduces the risk of it being damaged. By mounting it in this position the slightly downward-tilted beam reaches the area by the door at a suitable height.

Control system

The air conditioning is switched between two temperature settings: base cooling (when premises are empty) and comfort cooling. This is done by an additional thermostat (for base cooling), which, when presence is no longer detected, is coupled in by a relay output on the PD-2200 IR detector, which is connected in line with the built-in air conditioning thermostat. The method of connection must be tailored to the individual air conditioning system. Contact the supplier of the air conditioning system for advice. See the schematic diagram on the next page.

Presence-controlled air conditioning and lighting

The air conditioning is basically controlled in the same way as in the example above, but using two temperature sensors for base cooling (empty premises) and comfort cooling. The air conditioning unit is also switched off completely if the premises remain empty for an extended period 90 minutes in the example. This is done by using relay output 5 on EX-13 to switch off the power supply to the air conditioning unit via a contactor.

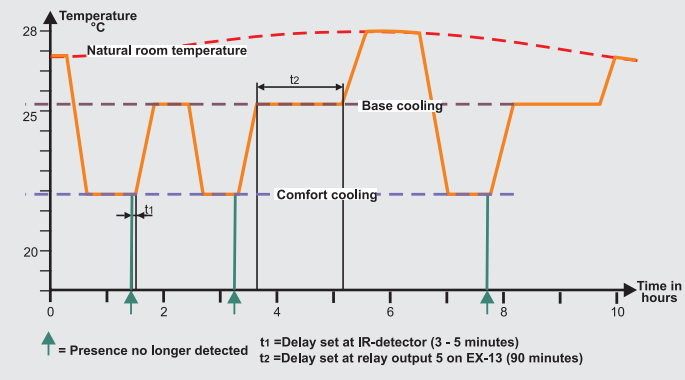
The lighting is divided into three groups by EX-13 to permit presence control. The lighting can be switched on manually (recommended) or automatically. The three lighting groups could, for example, be blackboard lighting, ceiling light fittings and lighting for the speaker. When presence is no longer detected the lighting is switched off automatically after the set time (3 - 5 minutes).

A potentiometer is connected to the 1 - 10 V inputs for the ceiling light fittings so that they can be dimmed manually and independently of the rest of the system.

See the “Schematic diagram of conference room with presence-controlled air conditioning and lighting in three groups” on the next page.

Hidden savings potential

The EX-13 logic module makes it possible to exploit the hidden savings potential by not switching on the lighting automatically when people enter the premises. If the natural light is adequate the lighting is not switched on. The desired lighting groups can be switched on using pushbuttons if required.



13A

Schematic diagram of conference room with presence-controlled air conditioning

Presence-controlled air conditioning offers major benefits

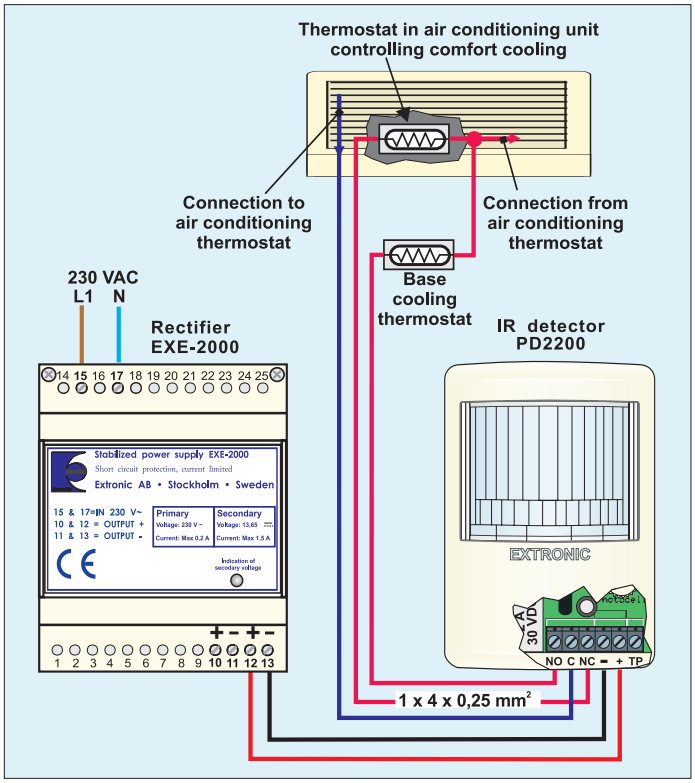
The air conditioning is switched between two temperature settings: base cooling (when premises are empty) and comfort cooling. This is done by an additional thermostat (for base cooling), which, when presence is no longer detected, is coupled in by a relay output on the PD-2200 IR detector, which is connected in line with the built-in air conditioning thermostat. The method of connection must be tailored to the individual air conditioning system. Contact the supplier of the air conditioning system for advice.

The IR detector is also available in a 24 V version, with the designation PD-2400.

NB: In applications that use a PD2200 detector, where people work at desks and do not move much, it is important that the detector mode jumper is set to the “Low/Office” position.

Product	Order No.
IR detector PD-2200	13140
Rectifier EXE-2000	18108

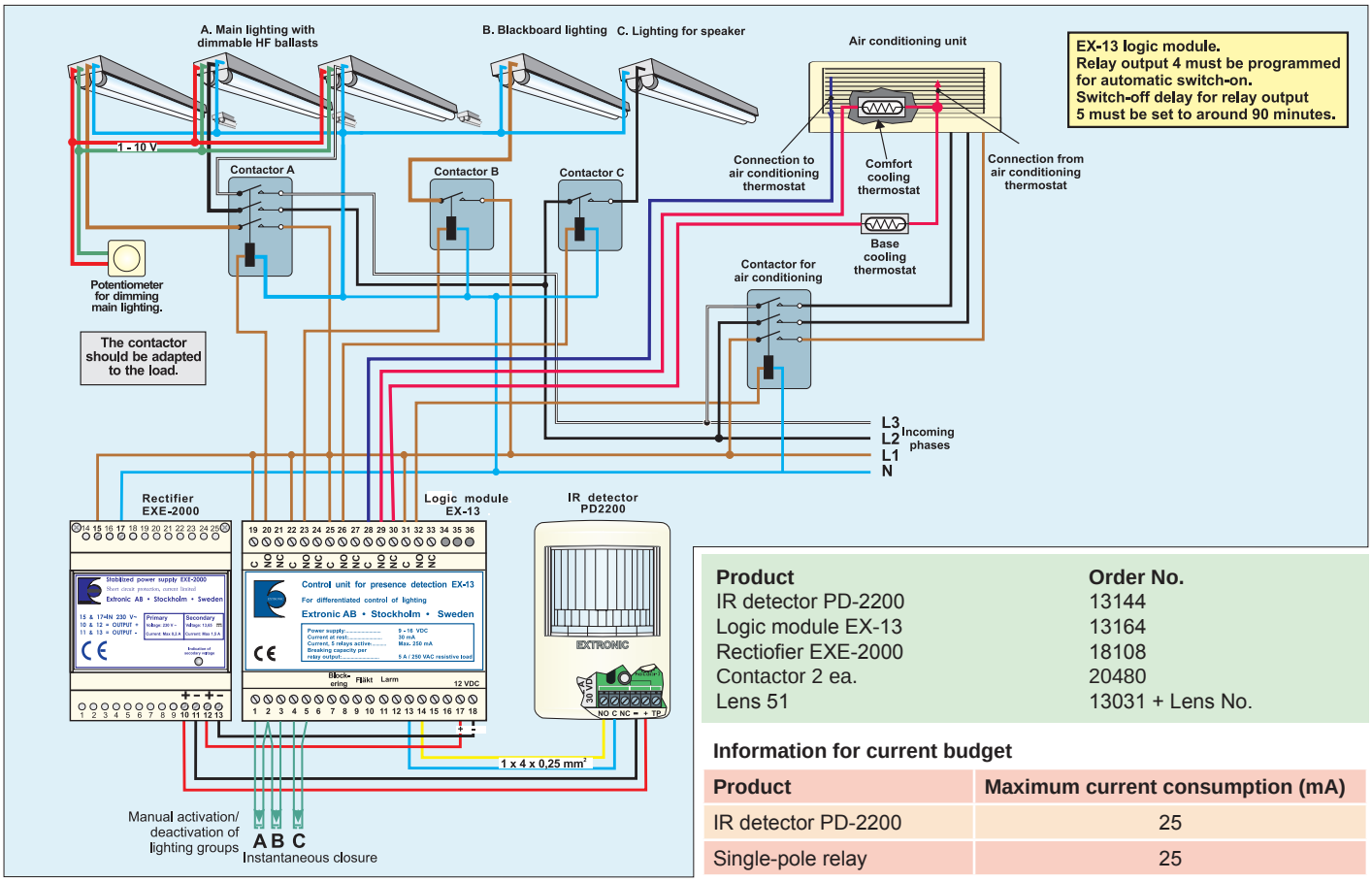
Options	Order No.
IR-detektor PD-2400	13144



Information for current budget

Product	Maximum current consumption (mA)
IR detector PD-2200	25

Schematic diagram of conference room with presence-controlled air conditioning and lighting in three groups



Product	Order No.
IR detector PD-2200	13144
Logic module EX-13	13164
Rectiofier EXE-2000	18108
Contactor 2 ea.	20480
Lens 51	13031 + Lens No.

Information for current budget

Product	Maximum current consumption (mA)
IR detector PD-2200	25
Single-pole relay	25

PM

Comments on lifetime of light sources in installations with presence control.

Dag Danell, 20 October 2006

The potential savings in premises where lighting is controlled by presence detection should not be underestimated. New acoustic detection technology has made it justifiable to control lighting in premises where this would not previously have been considered, such as changing rooms, garages, closed underpasses, public toilets and stairways. The ability to switch lighting on when someone is detected in premises is no longer difficult, although a combination of passive IR and auxiliary acoustic detectors may be needed in some cases to get the best performance.

The problem no longer lies with the presence detectors, as many people found in the past. The big problem is the light sources, which are not designed for intermittent operation, i.e. frequent switching on and off. Instead of light sources lasting for 8,000 hours they may only last a feeble 800 hours if frequently switched on and off. This naturally results in costly maintenance rather than a saving. Likewise, the durability of HF ballasts is still very poor.

The difficult part is finding light sources that are ideal for the installation in question, based on frequent use. Following light source manufacturers' advice to leave lights on for at least 20 minutes each time seems like a terrible waste. Remember that those 20 minutes are counted from the time that people have left the premises. Why should lights be left on for an extra 20 minutes every time someone passes through and closes the door? In other words it theoretically only needs three people to walk past in one hour for the lights to be left on continuously. In such a case it does make you wonder whether it is really worthwhile investing in presence-controlled lighting.

The suitability of older light fittings that are fitted with coil ballasts for intermittent use can be slightly improved by using electronic starters, such as Pulse Starter or Aura Light Strike. However, it would be better to replace the coil ballasts with HF ballasts and immediately improve energy efficiency by up to 25 per cent. HF ballasts by themselves do not make any big improvement in durability during intermittent operation, but choosing dimmable HF ballasts does open up a wealth of possibilities for reducing the strain on ballasts and light sources.

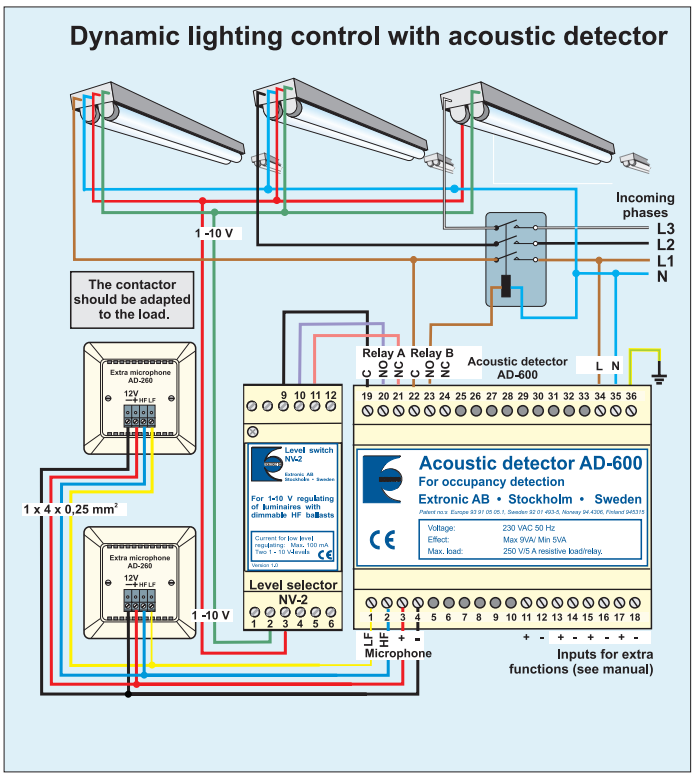
Exploit the latest technology

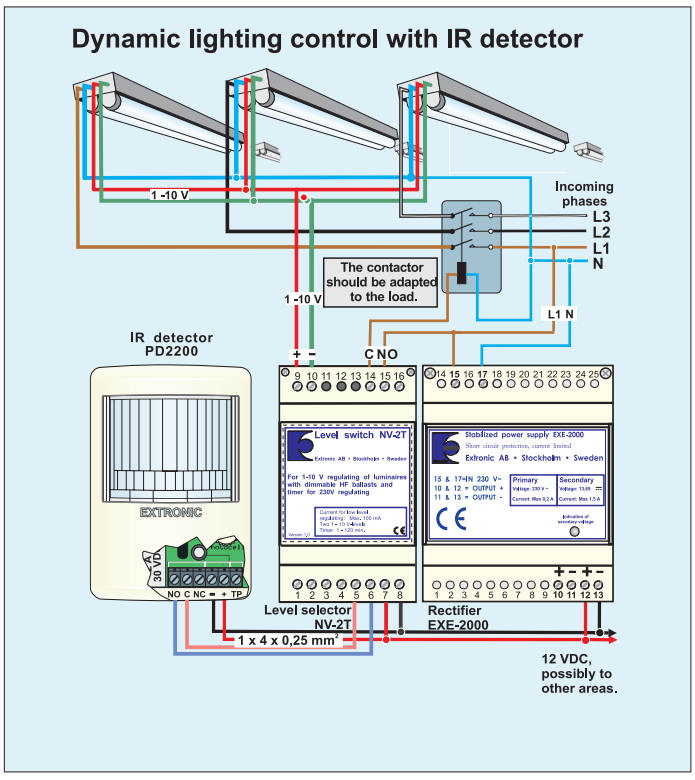
By using the latest technology and allowing people to determine, simply by their presence, whether the lights are lit or turned down low, we get what we call "Dynamic lighting control". This means that the lighting is adaptable and is automatically adjusted to suit the activities and presence in the premises.

A "Dynamic lighting system" almost eliminates the switching on and off of lighting; instead fluorescent tubes are dimmed between preset light levels. This means there is no need to follow the light source manufacturers' recommendations for long burn times. As a result there is no need to leave the lights on for 20 minutes after someone has left the premises. Instead they can be switched off after one minute, in other words a factor of 20 improvement.

The ability to control output by dimming between preset levels puts much less strain on light sources and HF ballasts, as well as reducing power consumption.

The following chart shows that "Dynamic lighting control" can be used regardless of the type of detection method.



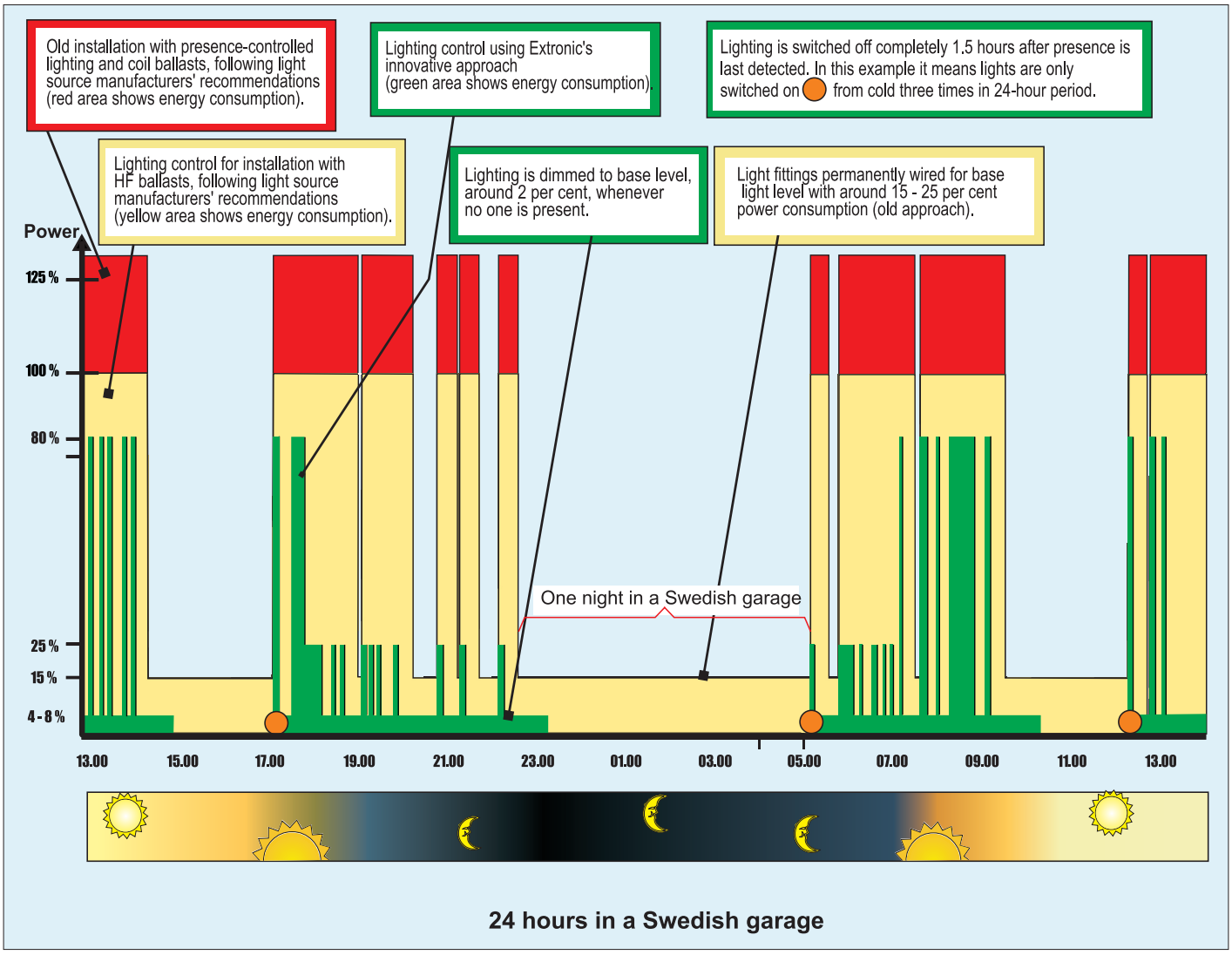


The energy graph below shows the very latest approach in a garage that uses a lighting system with "daylight-dependent dynamic presence detection".

This takes advantage of our own physiological characteristics to save energy. The fluorescent tubes are already slightly dimmed during operation (20%). This gives a 20-per-cent saving in energy that we barely notice. It is extremely difficult to see the difference. In rest mode we provide gentle and uniform base lighting at a level of 1 - 3 per cent, which, because our eyes adapt to the weaker lighting, is perceived as 10 - 15 per cent of the normal light level.

In addition, when it is dark outside, the system switches to night mode. When someone enters the garage the light level is increased to just 25 per cent, which does not destroy the night vision of car drivers. It can take up to 20 minutes to restore full night version after being dazzled. The administrator of the garage is unlikely to object to making a 75-per-cent energy saving during the hours of darkness.

What this means is that wear to ballasts and light sources is minimized by using "Dynamic lighting control" technology. Remember that the entire yellow area of the graph, and in some cases the red area as well (with coil ballasts), is the penalty you pay to your electricity supplier every day for choosing the wrong system and wasting energy.



24 hours in a Swedish garage

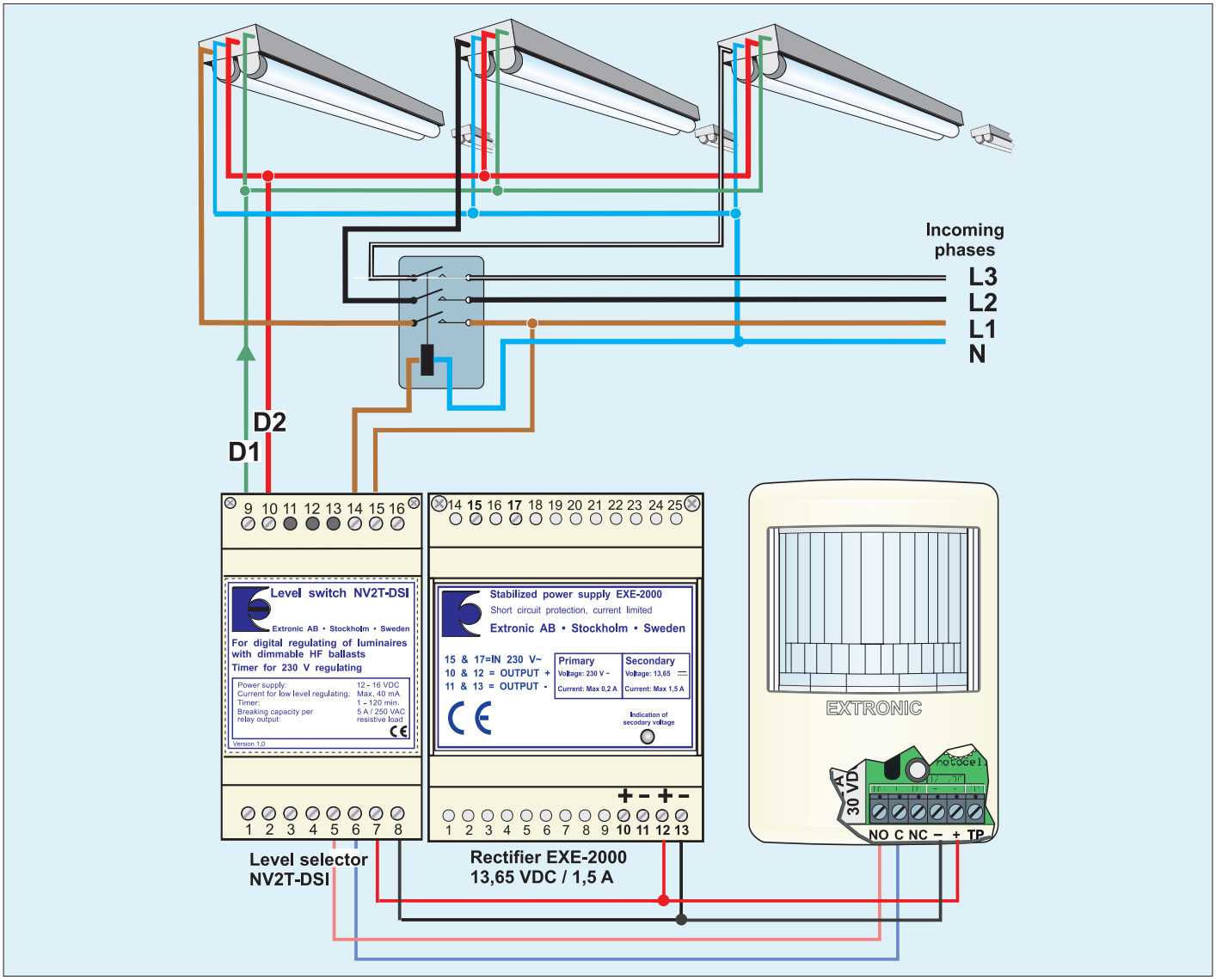
Alternative connections

Alternative connection with NV2T-DSI

Installing light fittings with digital ballasts in simple spaces such as stairways, garages and corridors may seem like technological overkill. Having to communicate with a microprocessor at each end of a lighting cable can appear unnecessary when simple level control can be achieved by adjusting resistance, using a 110V system. Digital level selection is a more expensive solution.

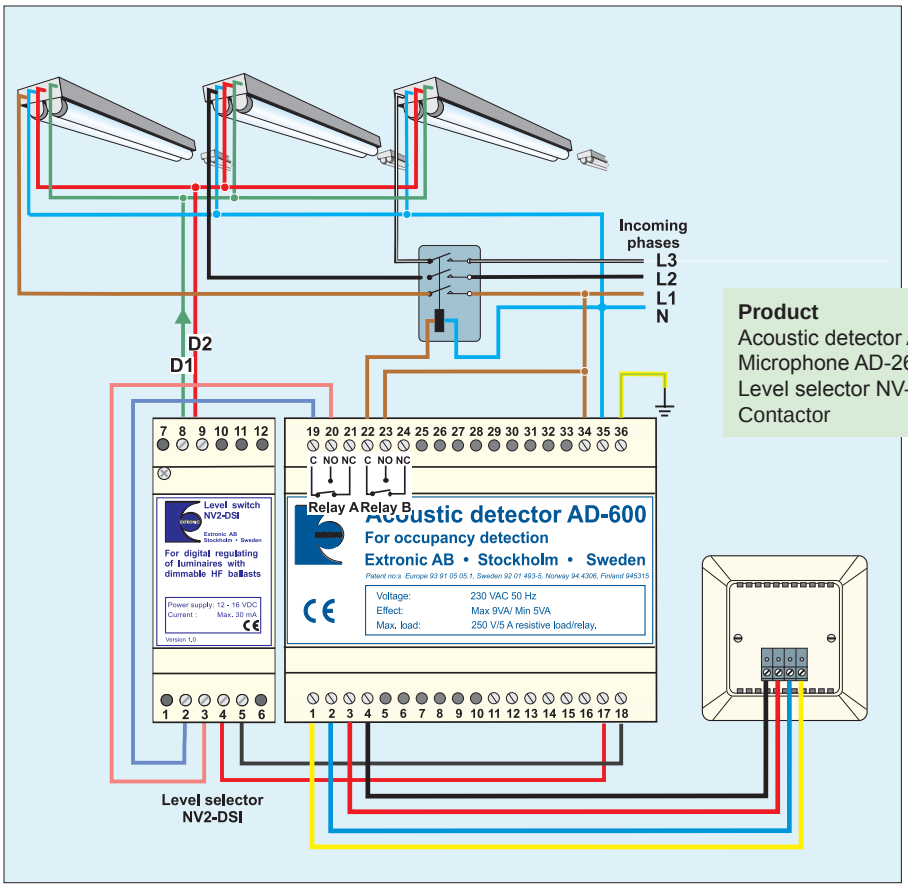
But to help out all those who admit to just having installed digital ballasts for some reason, we have developed digital variants of our existing NV-2 and NV-2T level selectors, which have the suffix DSI. A DSI variant of the NV-4, which is often used in garages, is not yet available.

See the wiring diagram below, which shows how to connect NV-2T DSI where control is by means of a PD-2200 passive IR detector.



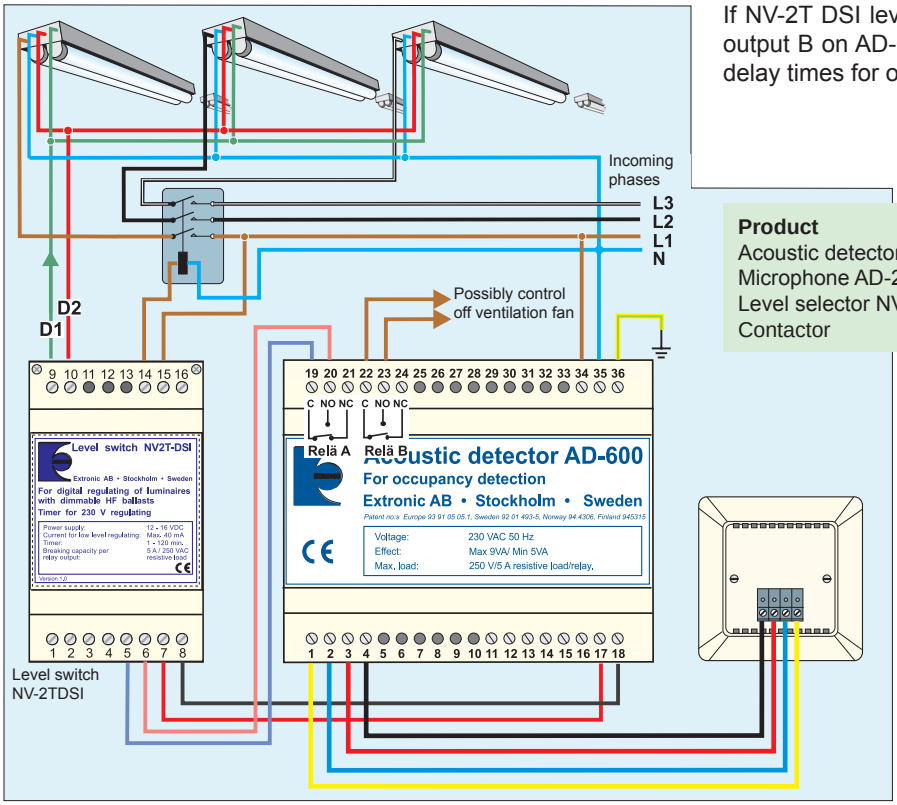
Product	Order No.
IR detector PD-2200	13140
Rectifier EXE-2000	18108
Level selector NV-2T DSI	13169B
Contactor	20480
Lens 41	13031 + Lens No.

Alternative connection with NV2-DSI



Product	Order No.
Acoustic detector AD-600	13091
Microphone AD-260U 2 ea.	13106
Level selector NV-2 DSI	13169a
Contactor	20480

Connection of NV2T-DSI level selector where control is by means of an acoustic detector and ventilation control.



If NV-2T DSI level selector is used in combination with AD-600, output B on AD-600 can be used to control ventilation fans. The delay times for output B can be adjusted separately.

Product	Order No.
Acoustic detector AD-600	13091
Microphone AD-260U 2 ea.	13106
Level selector NV-2T DSI	13169B
Contactor	20480

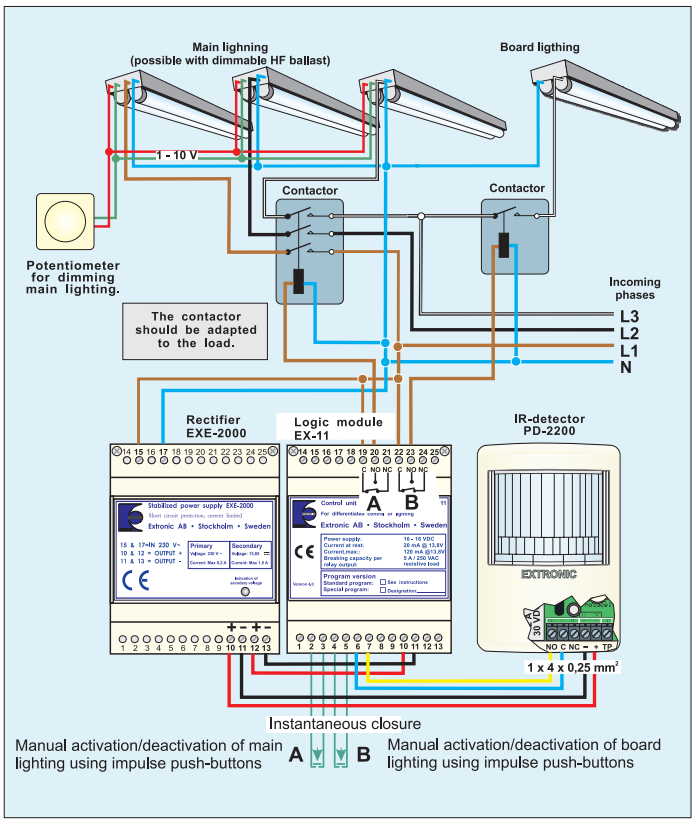
Right: Presence detection can also be used to control ventilation fans.

Manual dimmer in a system with a logic module

Dimming of lighting to a lower level always reduces energy consumption and can be used in all types of premises. A dimmer allows the light level to be adjusted to suit requirements at any time, which results in financial savings. When presence is detected the light level is always increased to the level that is set by the potentiometer.

This wiring example shows an installation in a lecture room with two groups of lighting, an EX-11 logic module and a dimmer. In this case the dimmer operates totally independently of the rest of the system.

The dimmer we recommend (order number 13172) has a “power limiting” feature, in other words it can be adjusted so that when it is turned to the maximum setting it only provides 80 percent of maximum light level. This provides an energy saving in its own right, but also greatly reduces wear to HF ballasts.



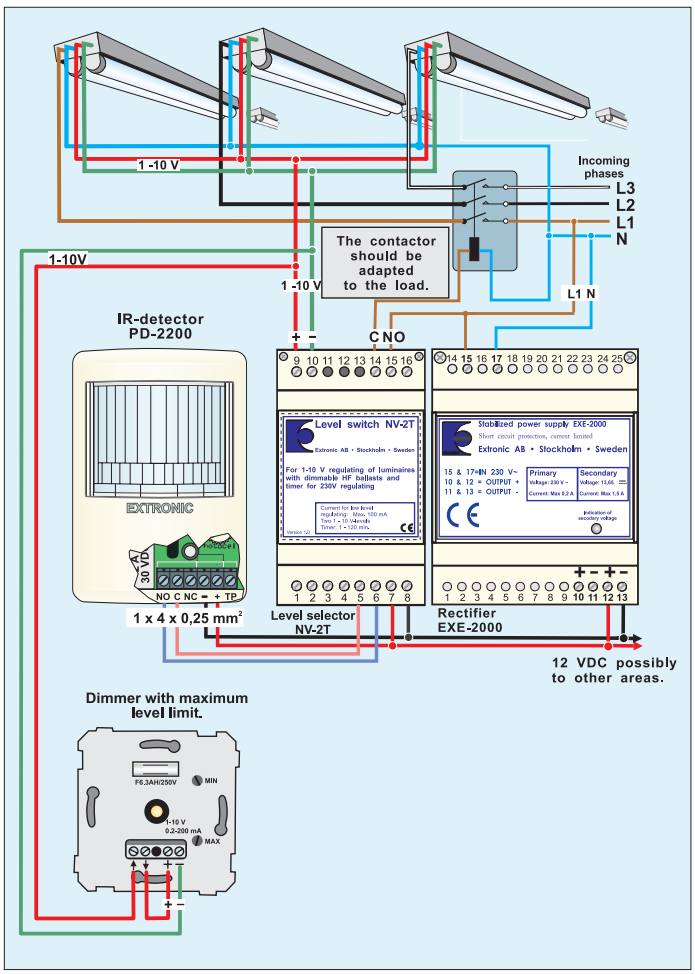
Product	Order No.
Dimmer	13172
IR detector PD-2200	13140
Logic module EX-11	13161
Rectifier EXE-2000	18108
Lens 51	13031 + Lens No.

See also application example 3A.

Manual dimmer in a system with a level selector

A manual dimmer can be connected to a system with a level selector that has 1–10 V control. The dimmer makes it possible to manually adjust the light level between the limits set by the level selector.

In this example NV-2T switches between two per cent and 80 per cent, for example. The dimmer minimum and maximum settings could be adjusted to slightly over two per cent and 60 per cent, respectively. When you press the dimmer button it switches the manual dimmer on or off. When it is switched on and when people are present, the light level always rises to the level set by the potentiometer.



Product	Order No.
Dimmer	13172
IR detector PD-2200	13140
Rectifier EXE-2000	18108
Level selector NV-2T(1-10V)	13169
Contactor	20480
Lens 41	13031 + Lens No.

See also application example 2C.