Basics of Movement Presence Detection &

ISC Learning Centre

July 2009
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Movement and presence detection

- Movement detector
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- Field of application
Movement detector

- 2 technologies in one product
  - Movement detection part: based on Passive Infra-Red (PIR) technology, the sensor detects movement in a sensing zone.
  - Brightness detection part: comparison of the ambient light to a predefined minimum level
  - Combination of Movement detection + Insufficient Brightness = Light automatically switched on for a set time period
Presence detector

- 2 technologies in one product + more accuracy + more intelligence
  - Movement detection (PIR) + precision lens → detection of very small movements (a few cm)
  - Brightness detection part (photodiode + PCB*)
- 2 independent output circuits:
  - C1 = Light (ON: presence + set time period + insufficient brightness)
  - C2 = Extraction fan (ON for a set time period)

Lens defines a greater number of sensing segments = Very small movements detected

* PCB = Printed Circuit Board
Movement detector

- **Brightness sensor part:**
  - Brightness detection part: based on photodiode + PCB* - Ambient light compared to a predefined minimum level.
  - When the ambient light is below the threshold, if movement is detected, the light can be switched on.

* PCB = Printed Circuit Board
Movement detector

- Infra-red movement detection part - Basic Principle:

A Passive Infra-Red (PIR) sensor:
1st step: measures infra-red (IR) radiation emitted by objects (& walls) in its sensing zone without the presence of people.
2nd step: apparent motion is detected when an infra-red source with another temperature, such as a human, passes in the sensing zone.

“Passive” means that the PIR device does not emit an infra-red beam but simply receives incoming infra-red radiation, passively.
Movement detector

- **Infra-red movement detection - Lens & Segments**
  - A multiple lens defines the sensing zone in segments.
  - Segments concentrate the radiation on the sensor.
  - The variation of infra-red radiation in a segment triggers the detection of movement.
  - The number of segments determines the accuracy of the detector. The more segments there are, the smaller the movements that will be detected.
  - Presence detection includes many segments. Even a small movement will cause a change in the segments and the presence will be detected.
Movement detector

- Infra-red movement detection - Consequences
  - Pets and warm objects (cars) are detected.
  - An object that becomes warmer without moving will not be detected, i.e. typically a heating system.
  - The level of sensitivity can be affected if the ambient temperature is close to that of the human body.
Movement detector

- Combination of brightness detection + movement detection

Movement detectors are optimised by the internal combination of a brightness sensor and a movement sensor.

The detector's power output is triggered when the ambient brightness is below the set point and a movement is detected. The time during which the output remains activated may be set on the product.
Customer benefits

- Provide comfort & energy savings in day-to-day life
  - **Automatic switch on**
    - Comfort: avoid searching for the switch in the dark or with arms full of shopping bags
    - Safety: avoid accidents in stairs
    - Hospitality: welcoming people (light outdoors)
  - **Automatic switch off after a set time period** (after the last movement)
    - Energy savings: in homes, no need to check if lights have been switched off correctly (forgotten by children, no need to go up to check,…)
    - In all buildings, optimised energy consumption (corridors, conference rooms, part of workshop/plant/warehouses when nobody is there)
  - Can also control *ventilation in toilets & bathrooms*

- **Security**
  - Switch on outdoor lights as soon as someone enters the sensing zone (to prevent the entry of night prowlers)

- **Cleanliness**
  - No need to touch the switch with dirty hands / gloves
Basics of Movement and Presence Detection

> Presence detection at home

- Switch on lighting only if the light level is insufficient

if the brightness is insufficient, the light remains on as long as a presence is detected
Corridors:

- Avoid accident in stairs in the dark
- Switch off automatically
Basics of Movement and Presence Detection

Presence detection at home

Bathroom

- Switch the light on/off
- Switch the fan on/off
Other Applications

● Hall
● Stairs
● Dressing room…
Presence / Movement detector – Wiring diagram

● Principle
  ● Here the detector is connected as a stand alone product, but also can be mixed with switch for local commands

● Application
  ● Outdoor (Movement detector only) to improve safety/ security during the night
  ● Indoor for an automatic switching off of lights where there is nobody
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Movement detectors at home

Entrances:

- Welcome people

When you come back home at night, outdoor lights switch on automatically.
Outdoors:

- Switch on as long as there is someone outside
- Improve safety during the night
- Improve security during the night

Safety
- Avoid people falling, bumping into static objects,…

Security
- Notify if someone is walking around the building
Save energy: Automatic switching off of lights where there is nobody

Typically, switch off lights in corridors, stairs, toilets, bathroom, dressing room, garage, outdoors while all the family is watching TV, reading/playin in bedrooms,...
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Examples of detection at home

- Presence control
  - Argus Presence 360

- Outdoor light control
  - Argus 220

- Entrance light control
  - Argus 220

- Terrace light control
  - Argus 220

- Corner light control
  - Argus 300
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> Movement detectors at the office

- Save energy by automatically switching lights off after the meeting
Basics of Movement and Presence Detection

> Movement detectors at the office

- Save energy in corridors, halls, toilets, stairs...

Just switch on when necessary!
Main parameters for classification

- Detectors are classified by
  - Angle of detection: 70°, 180°, 270°, 360°
  - Mounting height: 1.1 m or 2.2 m on wall, or ceiling mounting
  - Radius of the sensing zone depending on the mounting height
  - Number of switching segments, which makes it more or less sensitive
  - Brightness sensor capacity, i.e. 10 to 1000 Lux
  - Type of lights that can be connected and power rating. (Usual values: Indoor 300 to 1000 W - Outdoor up to 2000 W)
  - Time range of the internal timer: i.e. 30 s to 8 mn
  - Possibility of reducing the angle of detection if necessary
Typical settings

- Brightness level
- Sensitivity level
- Time

Movement detectors

Brightness Sensor

Sensitivity level

Time settings (Sec. to Mn)

Output circuit 1
For light

Output circuit 2
For fans, works on Presence sensor only
Main parameters for choosing a detector

- Outdoor / Indoor use?
- Movement or Presence detection? (linked to the type of room to be controlled)
- Physical location? (corridor, corners, ceiling, size of the sensing zone to be covered)
  - It defines the angle of detection and the number of sensors
- Type of use
  - For example: in schools, we recommend that the detector be installed at a height where it is out of the reach of children
- Number of wires (for renovation)
- Time adjustment (s to mn)
- Power of the load (W)
- Additional push-button to control lights manually
- Additional output to control a ventilation circuit from the same detector
PIR sensor installation recommendations 1/3

- Lateral installation with respect to the direction of motion
  - Optimal movement detection is only provided if the detector is installed laterally with respect to the detection range. (movements and segments are perpendicular)

  - This ensures that the zones are cut through as vertically as possible.

  - Installation in locations in which the objects to be detected move directly towards the movement detector considerably reduces the range.
PIR sensor installation recommendations 2/3

- Traps to be avoided during installation:
  - Indoor PIR sensors must not be facing windows.
  - Avoid interference from strong infra-red sources outdoors: vehicle headlights, sunlight reflecting from a vehicle window,…
  - PIR sensors must not be placed near HVAC fans
  - Avoid disturbances due to hot or cold air blown onto the detector. Air blowing on the plastic window cover could change the temperature of the plastic enough to create false signals.
  - Avoid all sources that are too hot (too close to lights,…)
  - As movement detectors also detect a level of brightness, avoid the presence of other lighting circuits which could prevent detection of the right level of brightness
  - Be careful not to block off the brightness sensor part.
PIR sensor installation recommendations 2/3

- The outdoor sensing zone must be clear:
  - No trees,
  - No unexpected passage through the beams.

- Where necessary, the range and angle of the sensing zone may be limited by appropriately positioning clip-on covers.
Schneider Electric's technical portfolio for movement detectors

- We provide movement detectors & presence detectors

- The solutions are available with:
  
  - Stand-alone detectors
    - Conventional hard-wired products
  
  - Combined with IHC (Intelligent Home Control) for Residential applications
  
  - BUS solution (KNX) for building or high-end residential applications
Overview of our portfolio

- **Indoor use**
  - Movement detection
  - Presence & Movement detection

- **Outdoor use**
  - Movement detection

* May be used indoors too.
Indoor - Overview

Movement detector

- 180° for System M
- 180° for Merten international
- 180° for Aquadesign

Presence detector

- 360° stand-alone product
  Optional: infra-red remote control
- 360° simple system for long/wide area
  (corridors,..)
Outdoor - Overview of the portfolio

ARGUS 70

ARGUS 300

ARGUS 360

ARGUS 110 Basic/ 220 Basic/
220 Advanced/ 220 KNX Advanced
Connection to KNX/LON systems

- **KNX principle:**
  - Intelligent components (such as push-buttons, movement detectors) are interconnected
  - A software tool may be used to create dimming function
- **For medium to large size buildings (and high-end residential)**
- **Movement detectors compatible with KNX**
  - 180° for System-M
  - 180° for Merten international
  - 220° Advanced
  - 360° Presence detector
  - 360° Presence with constant lighting control
  - 360° Presence with infra-red remote control

More info?
- Discover KNX on TSG
- Understand KNX 1 & 2 (in-class)
- KNX 3 Expert function (in-class)
- LON course (in-class)
IHC System

- **Principle:**
  - Central programmable unit located in the control cabinet
  - Several push-buttons and lights are connected to the central unit
  - Programming of function blocks to create the dimming function

- **For residential market or small offices**

- **Movement detectors compatible with IHC:**
  All detectors with relay output

- **Indoor detector**
  - 1.1m / 180°

- **Outdoor detector**
  - 110° / 6m

- **360° Argus Presence**

- **180° for System-M**

- **180° for Merten international**

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More info?
- Discover IHC on TSG
- Understand IHC (In-class)
- For part numbers, see IHC catalogue
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Thanks!
Make the most of your energy