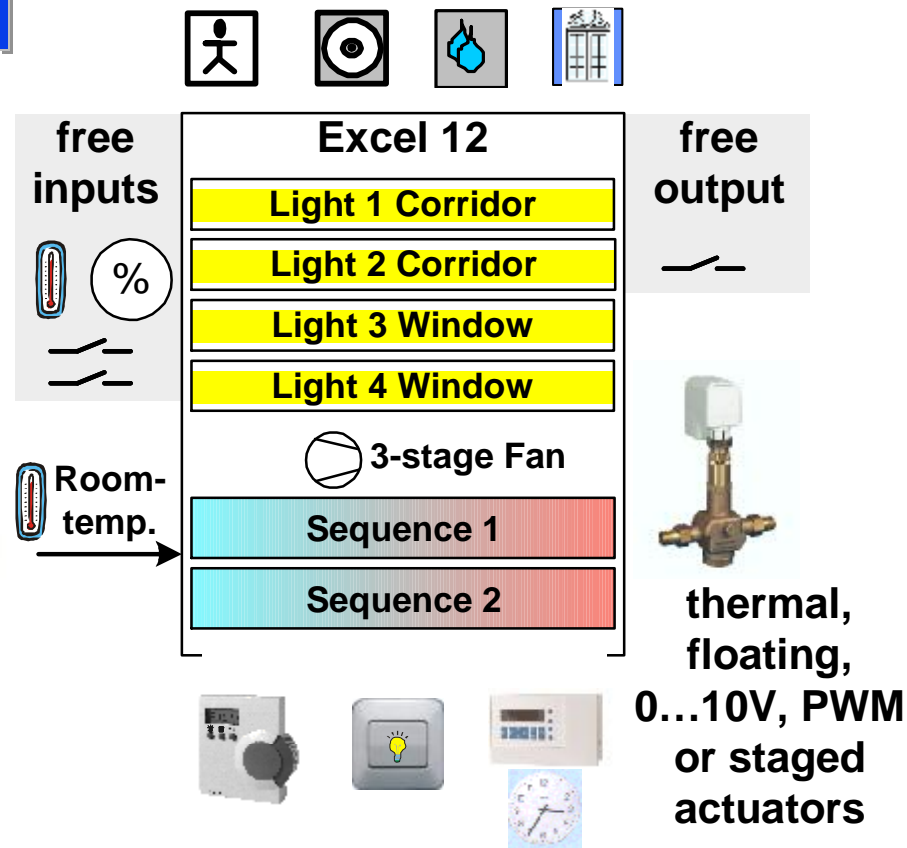


# Excel 12 FCU + 4 Lights Application

## Excel 12

### THE solution for Integrated Room Control



# Excel 12 - Objectives

## Objectives:

- ∅ Reduced total loop cost
- ∅ Increased light functionality and usage of free inputs
  - Lighting with 4 light loops (up to 2 constant light control lamps)
  - Free inputs:
    - one temperature input (NTC20k; nvoAiTemp)
    - one percentage input (0..10V or 2..10V; nvoAiValuePct)
    - two binary inputs (nvoDiSwitch[0/1])
  - Free output: one digital output can be switched via nviFreeOutput
  - HVAC application with 2 sequences

**PAST**

### 3-Controller Solution

Philips Light Controller

Honeywell XL10

FCU + chilled ceiling



**NOW**



**All in One Solution**  
**Excel 12**  
**2 HVAC sequences + 4 Lights**

**Honeywell**

# Excel 12 - Market Drivers

## Market Drivers:

### ∅ Lower Energy Cost & Integrate Operations

XL12 integrates light and HVAC functions in one controller and provides additional energy savings through constant light control.

Example:

Fluorescent lamps are in general 20 % over dimensioned because the efficiency of fluorescent lamps is reduced over the time. With constant light control the light output can be reduced by 20 % to achieve the required light level. This saves a lot of energy during the first 2 years of the lamps life time. Further savings are achieved as the light level is automatically adapted to the available sun light.

### ∅ Increase Flexibility

Easy adaptation to changed room usage via configuration change (e.g. master slave binding) instead of re-wiring.



Main Goals Users Wish to Accomplish Through Building Automation Investments  
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# Excel 12 – Advantages of an Integrated Solution

## Advantages of an Integrated Solution

### ∅ All control functions included in one unit

- Reduced device and installation cost
- Price advantage compared to solutions involving expensive integration of 3-rd party devices
- Hard wired sensors can be easily shared.  
Example: A hard wired occupancy sensor is used for HVAC and light control.

### ∅ Reduced services

- Reduction of technical clarification (no time consuming 3-rd party integration)
- Reduced bindings thanks to compact device (1 node instead of 3 nodes)

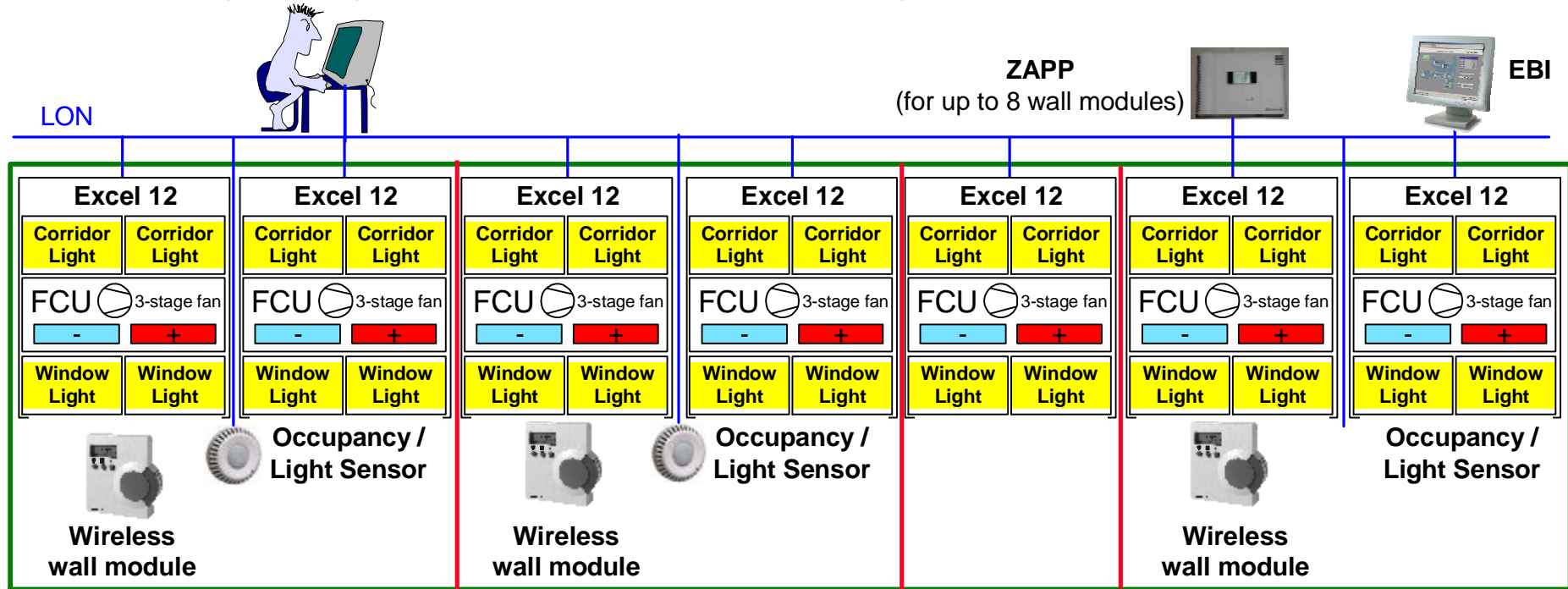
### ∅ No restriction of the openness

- Supports LONMARK®
- LNS plug-in and device resource files are available

# Excel 12 – Flexible Room

## Flexible Room:

- ∅ A room consists of several zones. Each zone includes the complete functionality for HVAC and lighting. Over the time it is often required to change the room layout, e.g. a room may be enlarged and includes now 3 zones instead of 2.
- ∅ Excel 12 helps you to adapt to a changed room usage by means of software re-configuration instead of re-wiring.
- ∅ Wireless wall modules (ZAPP) in combination with Excel 12 are providing additional flexibility. Simply move the wall module wherever you need it.



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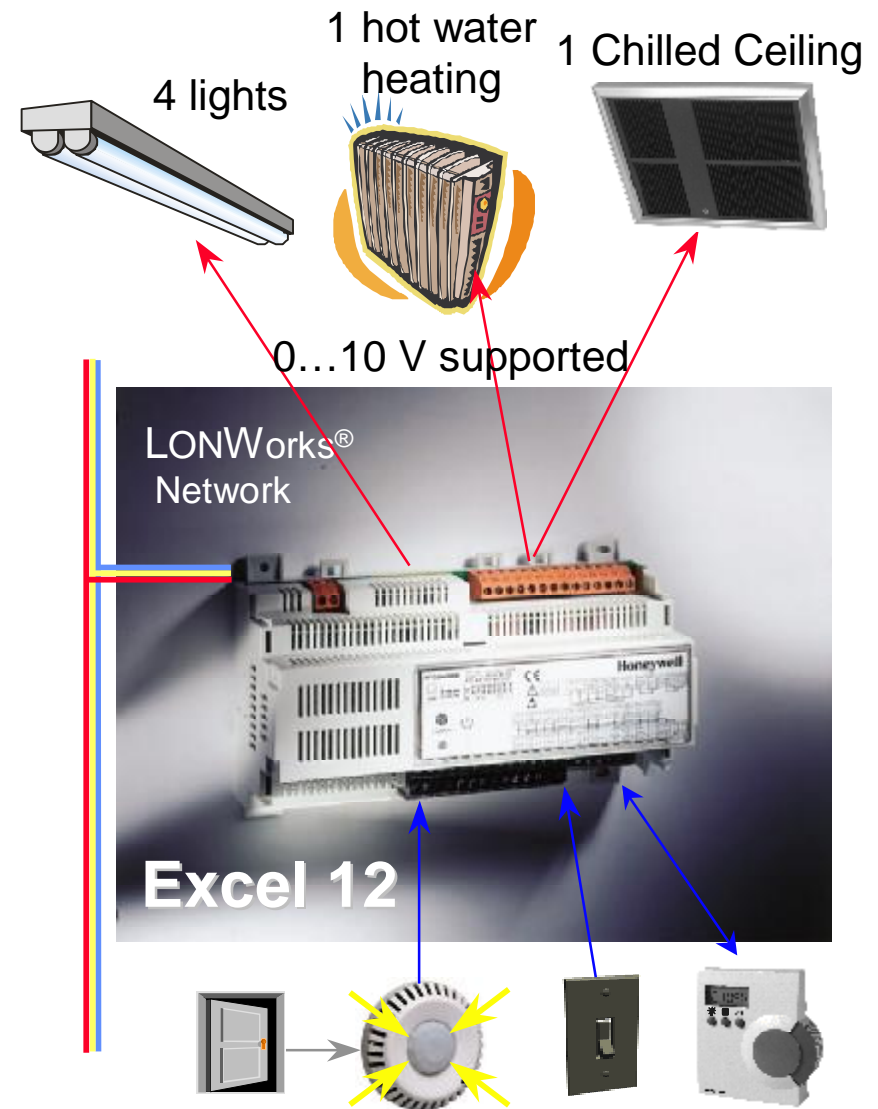
# Excel 12 – Application Overview

## HVAC:

- ∅ 2 sequences, e.g. hot water heating + chilled ceiling
- ∅ Cooling valve closed in case of condensation
- ∅ 3-stage fan
- ∅ Different actuators types (thermal, floating, 0...10V, PWM, staged).
- ∅ Energy hold off function

## 4 Lights:

- ∅ Constant light control and dimming for up to 2 lights
- ∅ Switching of 4 lights depending on central command, manual command, occupancy and light level.  
Grouping of lights (up to 4 lights switched via one push button).



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# Excel 12 – Application Overview

## Free Inputs:

∅ Unused analog or digital inputs may be used for binding and monitoring via LON.

XL12 supports the following input types:

§ one temperature input (NTC20k; nvoAiTemp)

§ one percentage input (0..10V or 2..10V; nvoAiValuePct)

§ two binary inputs (nvoDiSwitch[0/1])

## Free Output:

∅ One digital output may be switched via nviFreeOutput.

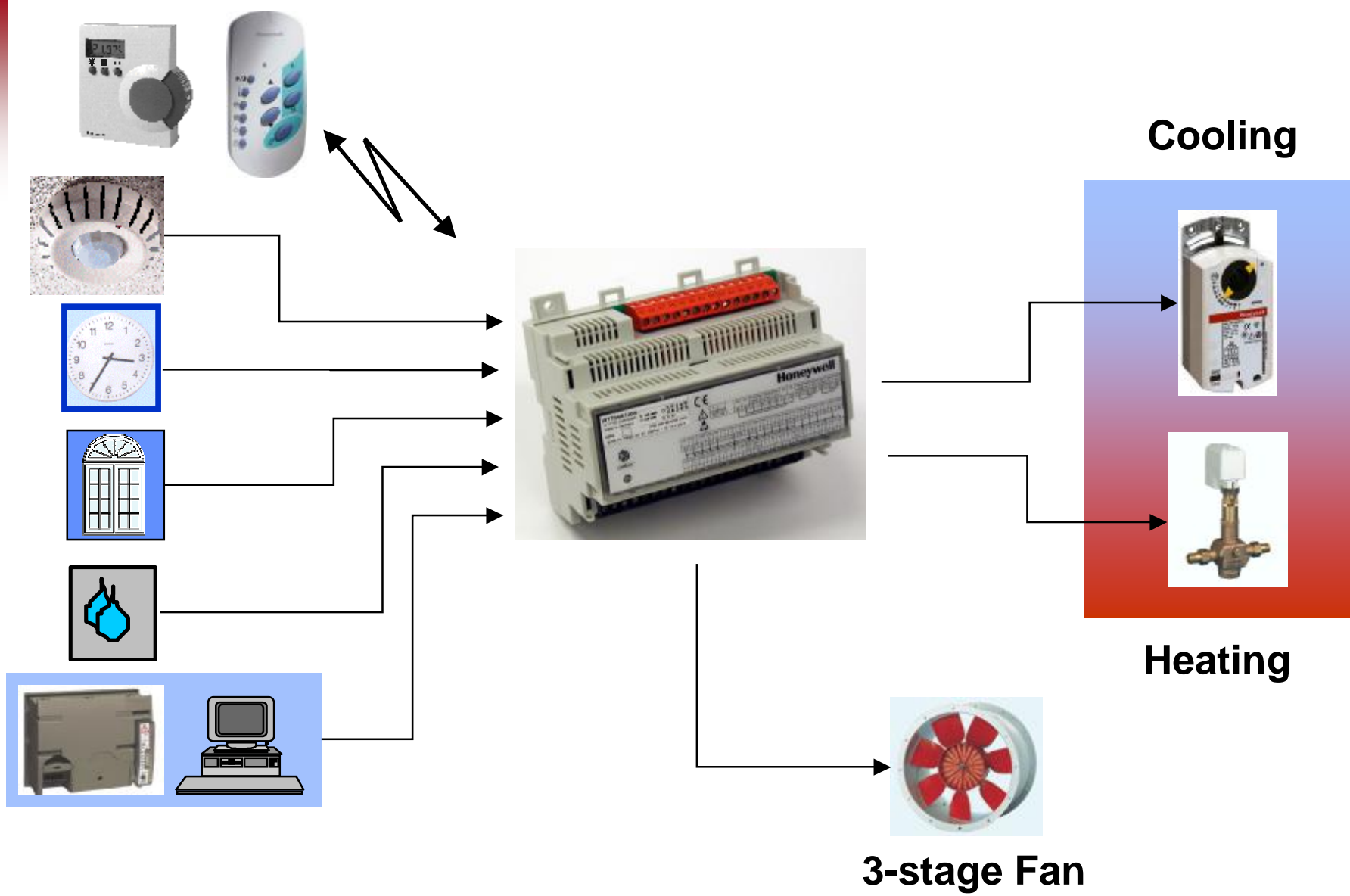
## Examples for the usage of this features:

∅ XL500 uses an analog input to monitor the humidity in a room and a relay output in the XL12 to switch On/Off a dehumidifier in a room.

∅ An analog input is used to monitor a temperature in the room



# Excel 12 – Temperature Control



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# Excel 12 – Temperature Control

## Overview:

∅ LONMark profiles “Space Comfort Controller” and “Occupancy Sensor” supported

### ∅ Functions

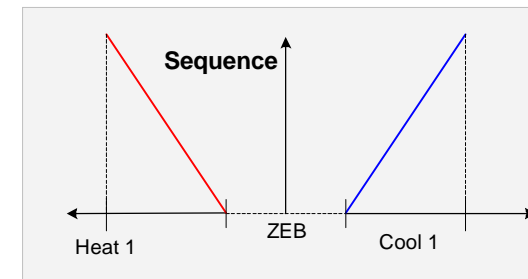
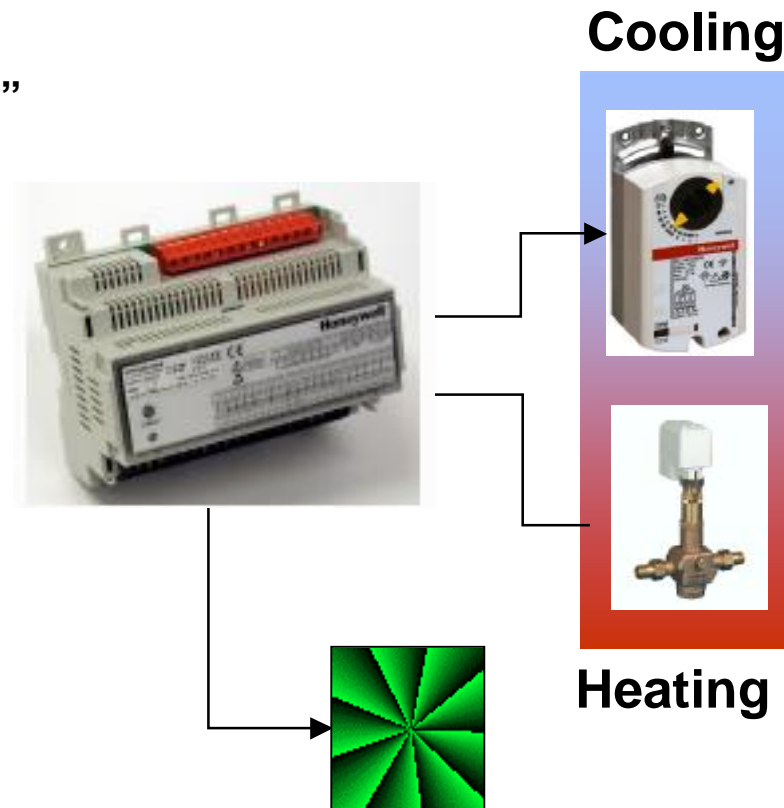
- Two sequences with zero energy band
- Changeover operation
- Chilled ceiling control with condensation switch

### ∅ Physical outputs

- Floating
- Staged output (1 to 3)
- PWM outputs
- Thermal actuators

### ∅ Fan control

- Up to three-stage fan with three relays 6 A at NO contact



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# Excel 12 – Temperature Control

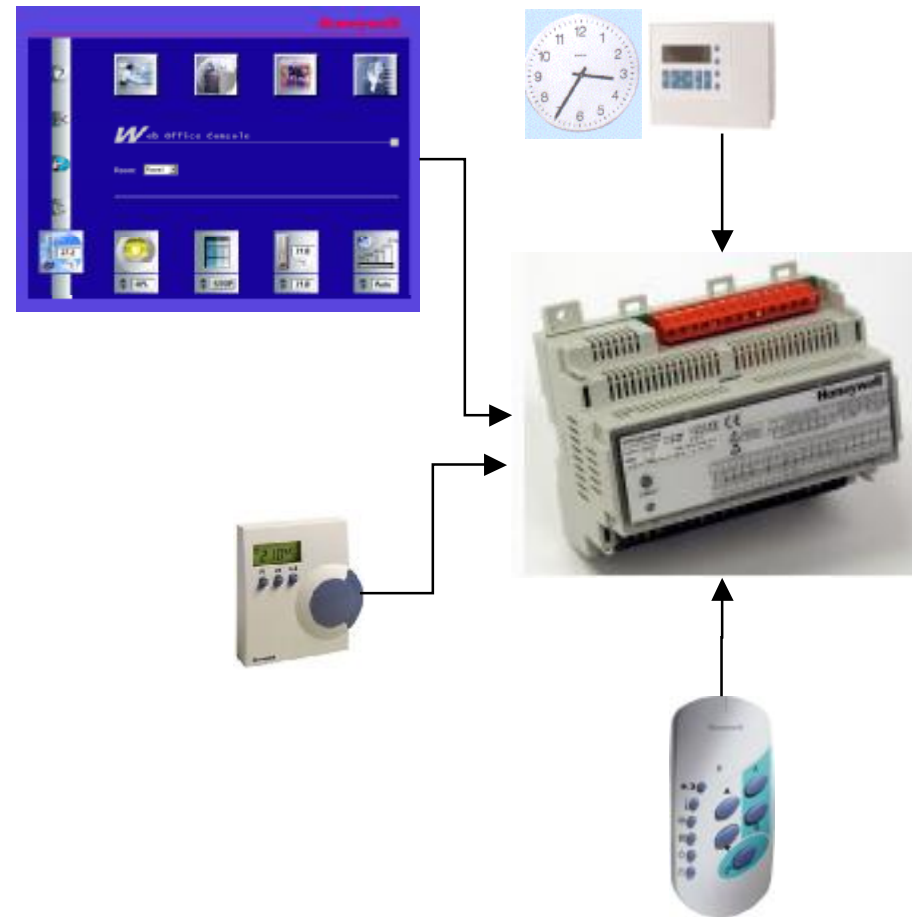
## Operation:

### ∅ Physical inputs

- Room temperature
- Set-point adjustment, absolute or relative
- Fan speed switch 0-A-1-2-3
- Occupancy sensor input

### ∅ Network variables for LON access, e.g. from WOC, EBI, XL500 controller or wireless wall module / hand-held via ZAPP

- Room temperature
- Set-point adjustment
- Fan speed command
- Occupancy mode



# Excel 12 – Temperature Control

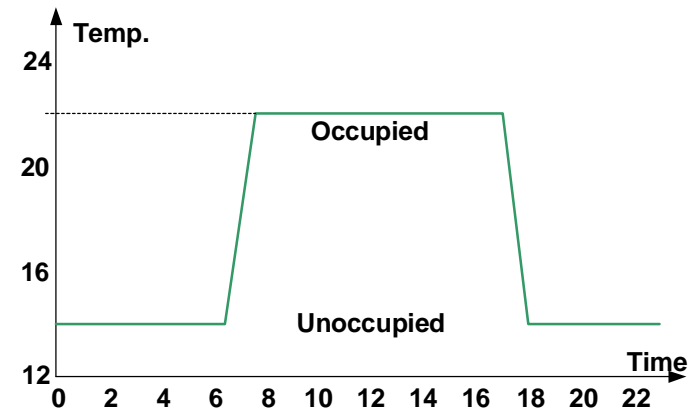
## Occupancy functions:

### ∅ Occupancy mode changed by

- sensor
- XL500 occupancy schedule

### ∅ Bypass button for

- Manual presence detection
- Extension of the occupied time



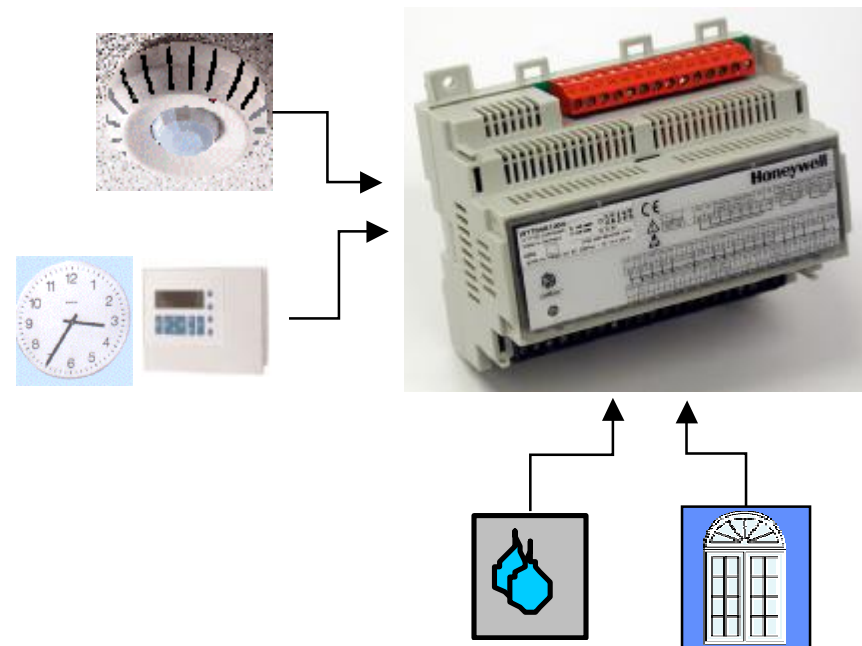
## Safety Functions:

### ∅ Condensation switch

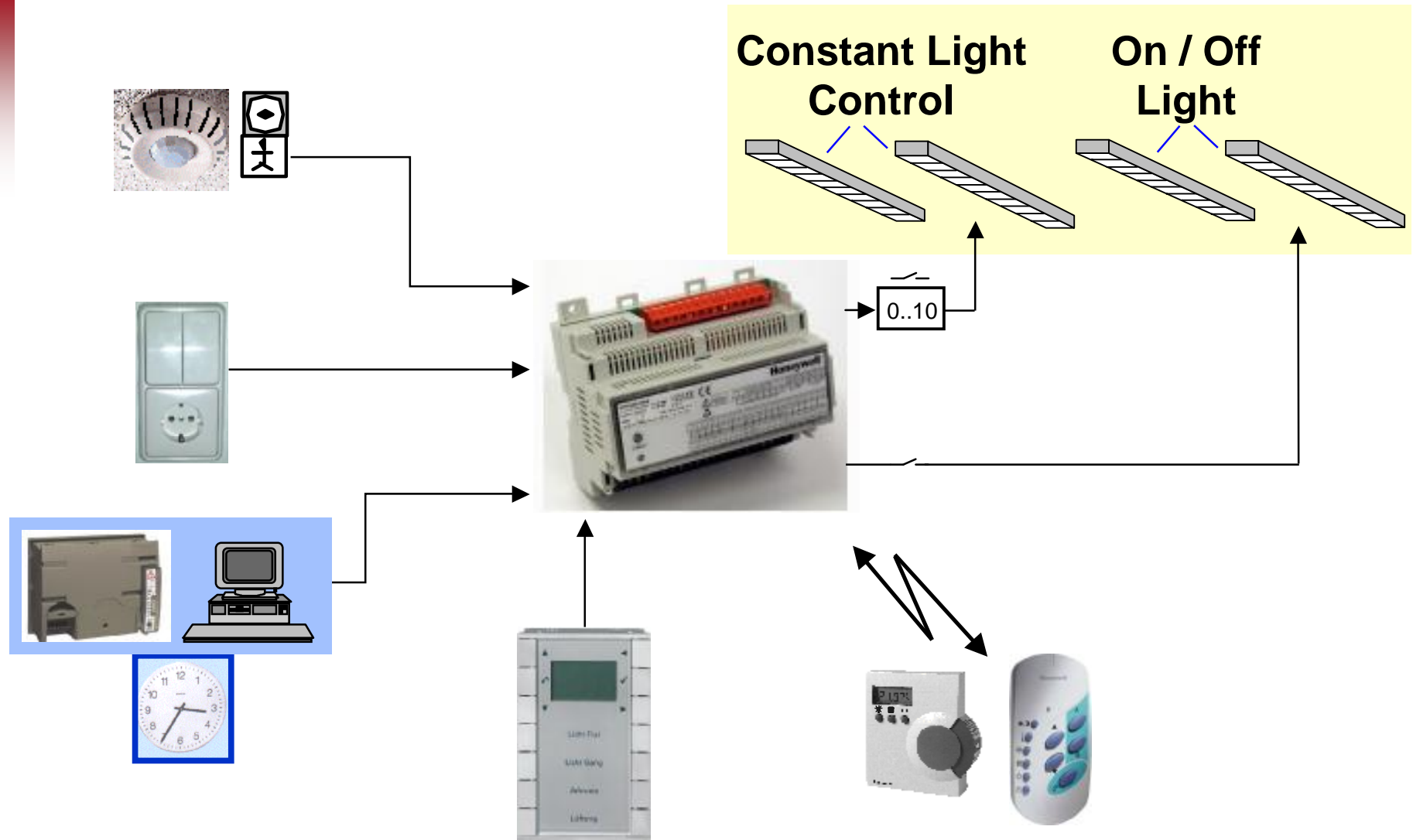
- binary input (no dew-point calculation)

### ∅ Energy hold off

- binary input or via NV
- Heating / cooling is stopped in case of energy hold off



# Excel 12 – Light Control

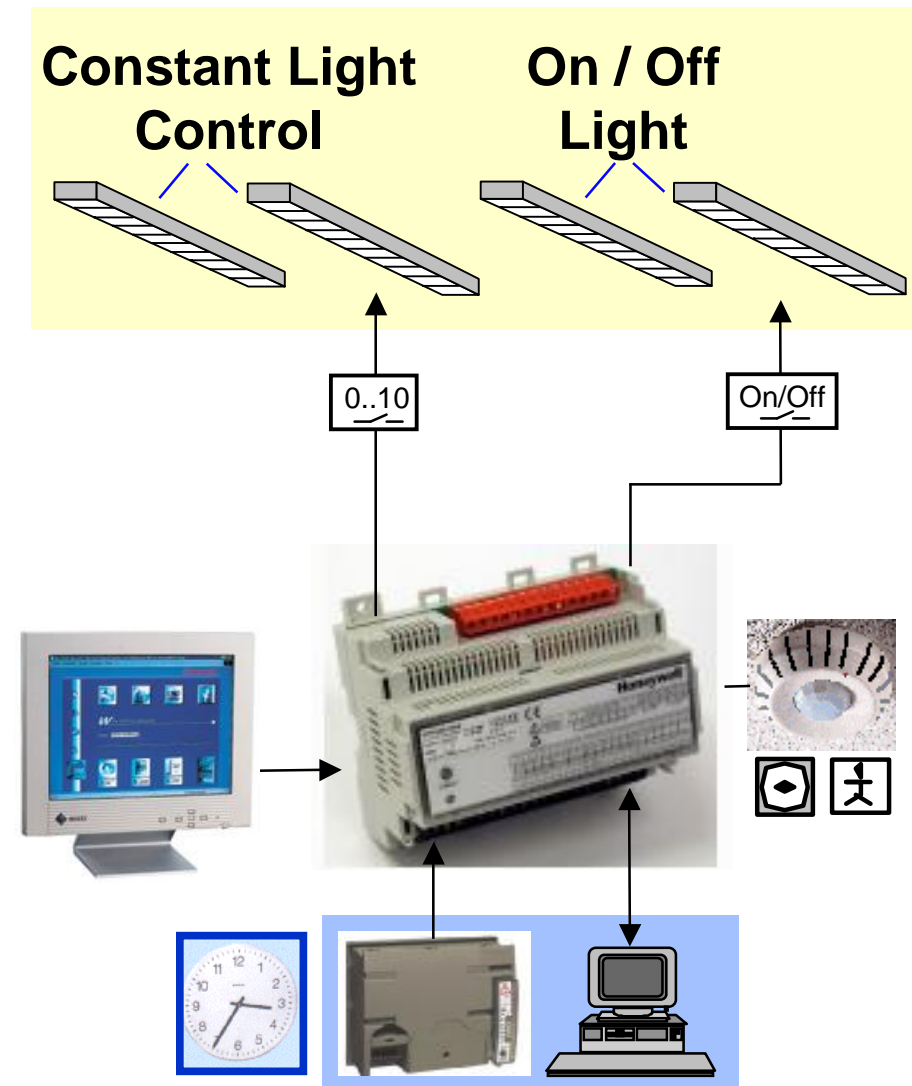


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# Excel 12 – Light Control

## Functionality

- ∅ LONMark profile “Lamp Actuator”
- ∅ LON functionality
  - Lights are switched according to occupancy schedule running on XL500
  - Override / monitoring via EBI
  - WOC can be used for office control
- ∅ Grouping of lights is supported, e.g. one push button is used to switch 4 lights
- ∅ Soft on / off (2 times)
- ∅ LON and hard wired light sensors are supported (LON has priority)
- ∅ LON or hard wired occupancy sensors are supported



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# Excel 12 – Light Control

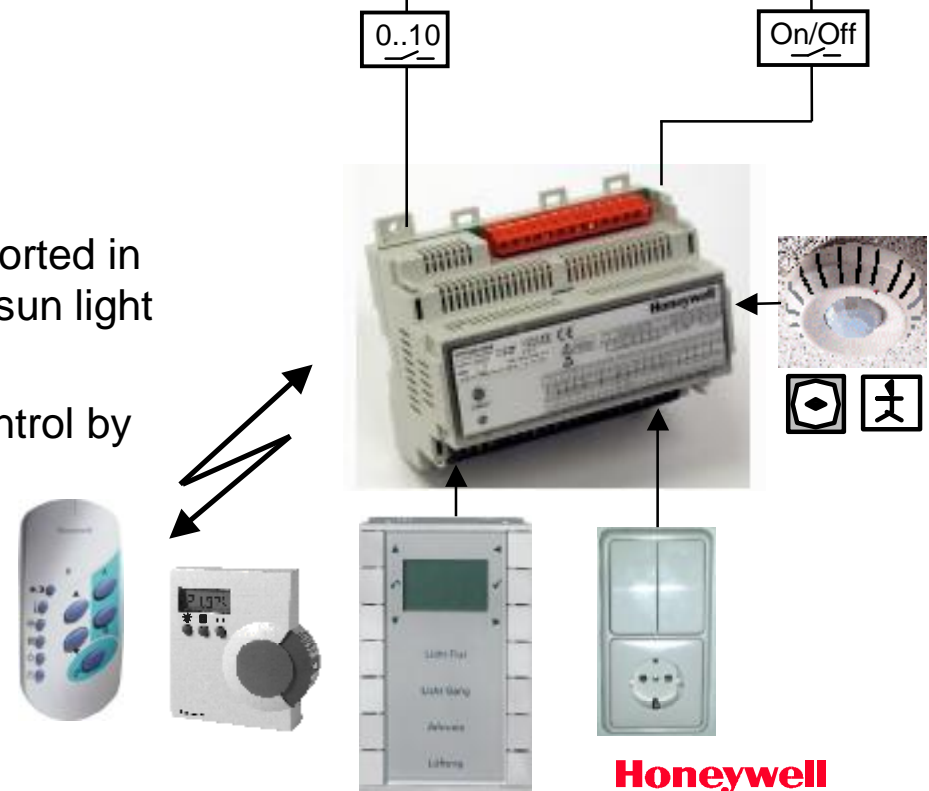
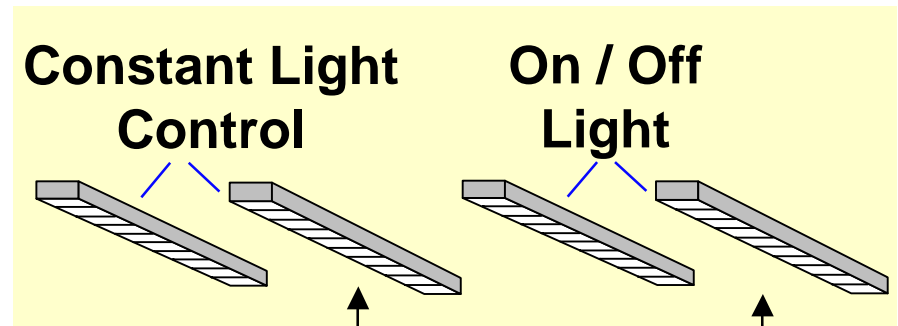
## Functionality

### ∅ Manual switching / dimming via

- Hard wired push button
- Via LON wall module
- Via wireless wall module / remote hand held (ZAPP)

### ∅ Automatic controls for up to 4 lights

- Constant light control for up to 2 lights
  - o Independent set-points supported
  - o Control offset for window light supported in order to compensate for additional sun light in window area.
  - o User can override constant light control by manual dimming
- On / off control for up to 4 lights
  - o Automatic switching dependant on occupancy / light level



# Excel 12 –Energy Savings

## Energy saving functions:

### ∅ General

- Occupied, standby, unoccupied mode saves energy if the room is not used. The mode can be changed via occupancy sensor, via LON (time program or building supervisor) or manually by the user (occupancy bypass time via wall module)
- Equipment can be switched off from a building supervisor

### ∅ Light

- Automatic functions, e.g. off if bright or unoccupied
- Constant light control saves 25-30 % energy (source: OSRAM)
- Window correction for control of 2 lights with one light level sensor



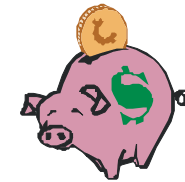
# Excel 12 – Energy Savings

## Energy saving functions:

### ∅ HVAC

- Set-point limitation in wall module and set-point / fan reset at night helps saving energy.
- Adjustable start levels for sequences and fan stages are optimizing the control, e.g. limit expensive electric heating as much as possible.
- Fast and good control (e.g. PI boost) with adjustable zero energy band.
- Energy hold off contact
- Sensor failure detection
- Master /slave functionality (e.g. avoid that 1 FCU heats while the other cools if booth units are in the same room)
- Demand to primary control will help optimizing the primary control
- Adjustable hysteresis and minimum on / off time are reducing unnecessary switching

**\$SAVINGS\$**





# Excel 12 – Monitoring

## Free Inputs / Output:

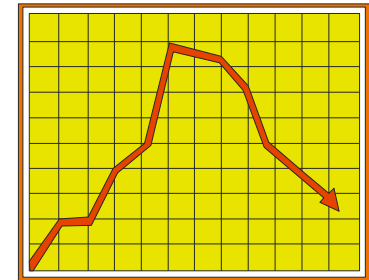
- ∅ **LONMark profile “Analog Input” and “Switch”**
  
- ∅ **Free inputs may be used for monitoring or binding via LON:**
  - One temperature input (NTC20k) is communicated via nvoAiTemp.
  - One percentage input (0..10V or 2..10V) is communicated via nvoAiValuePct.
  - Two binary inputs are communicated via nvoDiSwitch[0/1].
  
- ∅ **A free digital output may be used to switch equipment via LON (nviFreeOutput).**

# Excel 12 – Monitoring

## Monitoring:

∅ The following nvo's may be used to monitor a room:

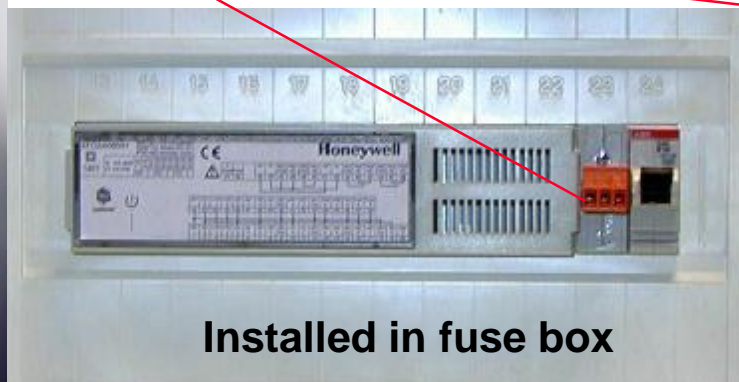
- nvoSpaceTemp: room temperature
- nvoEnergyHoldOff: may be used by primary control to cut off primary energy.
- nvoSequence: sequence level; used for master / slave
- nvoHeatCool: actual heat / cool mode of the controller; used for master / slave
- NvoFanSpeed: fan level; used for master / slave
- nvoEffectOcc: effective occupancy status; used for master / slave
- nvoOccSensor: signal from a hard-wired occupancy connected to XL12
- nvoLampValue: lamp value feed-back, e.g. master slave of additional lamps
- nvoUnitStatus: controller status information, e.g. in alarm, heat / cool status...
- nvoDiagnostic: provides status information for trouble shooting, e.g. sensor failure, valve synchronization, condensation, wait for fan, power up mode, fan interlock etc.



# Excel 12 – Installation

## Installation Friendly

- ∅ Compact design fitting into fuse boxes
- ∅ Different power supplies (24 Vac and 230 Vac)
- ∅ Optional terminal covers for wall mounting
- ∅ Lon service button easily accessible
- ∅ LNS plug-in available
- ∅ Flash memory for easy application update
- ∅ Optional XAL-Term for LON tool connection and LON termination



# Excel 12 – Hardware Variants

## Excel 12 Hardware Variants

Order number	Power Supply 2: 230 Vac, 3: 24 Vac	Digital Inputs	Digital Outputs	Normally Open Relays	Change Over Relays	Triacs	Wall Mod LED *W	Analog Inputs (see Note)	NTC20K Sensor (10 bit) + Voltage	NTC20K Sensor (10 bit)	NTC20K Sensor (10 bit) *W	Fan Speed / Bypass *W	Set Point Knob *W	Analog Outputs (0...10Vdc)
W7704A1004	2	4	9	3	2	4	1	7	3	1	1	1	1	2
W7704B1002	2	4	9	3	0	6	1	7	3	1	1	1	1	2
W7704C1000	3	4	6	0	0	6	1	7	3	1	1	1	1	2
W7704D1008	3	4	11	3	2	6	1	7	3	1	1	1	1	2
W7704D1016	2	4	11	3	2	6	1	7	3	1	1	1	1	2
W7704F1003*	2	4	4	3	1	0	0	2	1	1	0	0	0	2

\*W: Signal is used for a hard wired wall module

\*: Low cost variant for light, supports no hard-wired wallmodule

Relays: continuous 6 A

Maximum peak current 80 A for 20 ms

Analog outputs

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