



Microwave detectors - ceiling-mounted and tilt adjustable

FEATURES

Switching detectors



WITH LUX LEVEL SENSING



SWITCHING DETECTOR

- Occupancy detection and switching with lux level sensing
- Time delay function (10 second - 99 minutes)
- Dual sensitivity: independently configurable ON and OFF motion sensitivity
- Presence or absence detection functionality
- Programmable via remote handsets: 0041546 or 0041562
- User handset available to control
- Accessory enables surface mounting
- The wall mounting bracket enables the adjustable microwave sensor, installed within a surface mounting back box, to be attached at a lower height than the ceiling, for example in a position below the level of direct/indirect luminaires
- Switching versions may be connected in parallel for larger areas, e.g. 'L shaped corridors'



0041556
0041557



0041551*
0041552*
0041553*



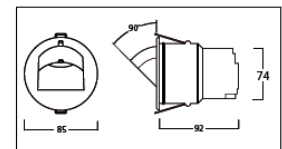
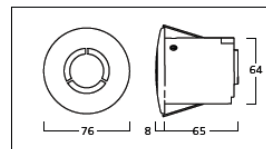
Dimming detectors



DIMMING DETECTORS WITH LUX LEVEL SENSING

- DSI, DALI or 1-10V dimming versions
- Two channel flexibility: one switched, one dimming on DALI version
- Step-down illumination
- Scene setting and recall
- Lamp burn-in
- Control capacity: digital detectors up to 20 DALI dimming ballasts (10 if channel 1 relay used), analogue detectors up to 10 dimming ballasts
- Can also control heating and ventilation loads

Dimensions (mm)



ORDER ODE	DESCRIPTION	LOAD RATING AT 230VAC	
		R/W/F & CF	TIME DELAY
Occupancy linked detectors with lux level sensing			
0041551*	Adjustable head microwave presence/absence detector with lux level sensing, infrared override and time delay function	10A	10 sec to 99 min
0041556	Ceiling-mounted microwave detector switched		
Occupancy-linked detectors with lux level sensing and dimming			
0041552*	Adjustable head microwave presence/absence detector with dimming and time delay function. DALI dimming output.	10A	10 sec to 99 min
0041553*	Adjustable head microwave presence/absence detector for 1-10V analogue dimming output	10A	15 sec to 30 min
0041557	Ceiling-mounted microwave detector Direct Dim, DALI / DSI		

ACCESSORIES	DESCRIPTION
0041546	Handheld programming device
0041591	Surface mounting back box for microwave sensors
0051562	Programming handset for lux level sensing and dimming detectors
0041593	Surface mounting back box extender ring for microwave sensors
0041638	User handset override on/off; lux up/lux down (lux level sensing & dimming models)
0041592	Wall mounting bracket

R = Resistive; I = Incandescent; Fluorescent; CF = Compact Fluorescent



0041546



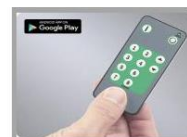
0041593



0041591



0051562

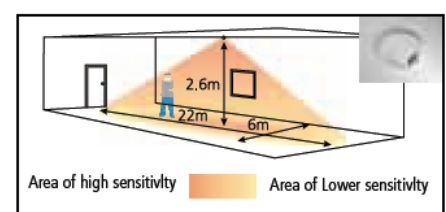
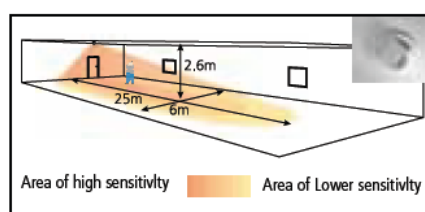
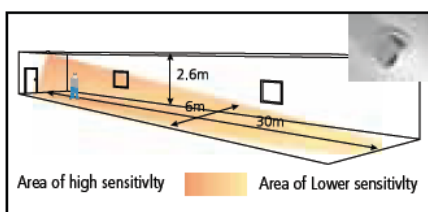
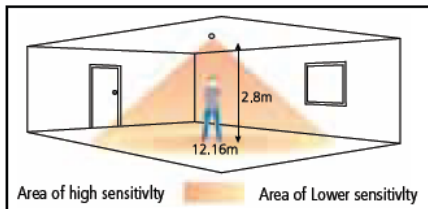


0041638

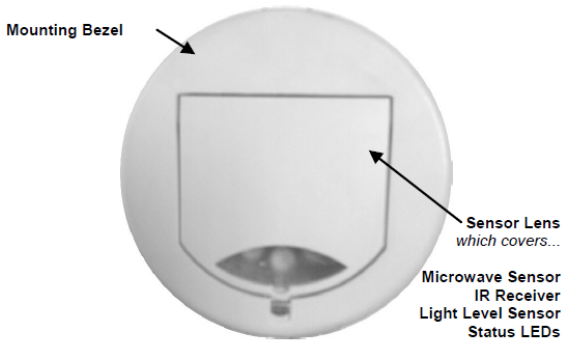


0041592

Detection pattern



Front features



Microwave Sensor

Detects movement within the unit's detection range, allowing load control in response to changes in occupancy.

IR Receiver



Receives control and programming commands from an IR (infrared) handset.

Light Level Sensor

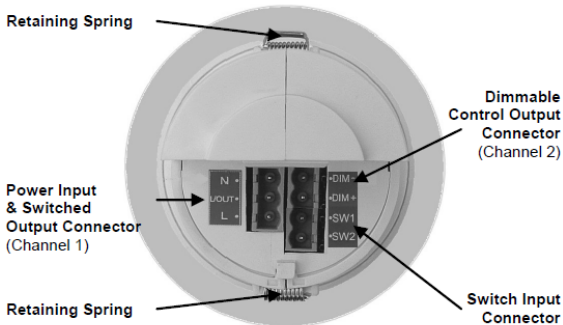
Measures the overall light level in the detection area

Status LEDs

The LED flashes Red to indicate the following:

Walk Test LED active	 when movement is detected
Valid setting received	

Back features



Power Input & Switched Output Connector (Channel 1)
Used to connect mains power to the unit and to connect a switched load.

Dimmable Control Output Connector (Channel 2)
Used to connect DSI/DALI controllable ballasts and transformers for dimmable loads.

Switch Input Connector

Two input terminals can be used to manually override the dimming levels and override the lights on or off.

Sensor functionality

Detection Mode

The Detection Mode can be set to behave in Presence or Absence mode:

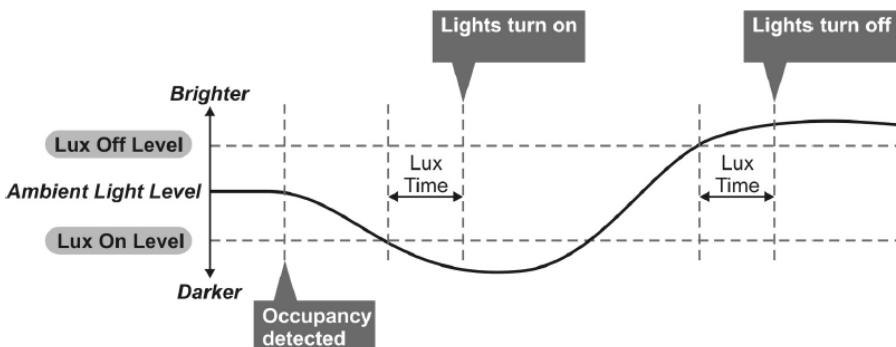
- **Presence** When movement is detected the load will automatically turn on. When the area is no longer occupied the load will automatically switch off after an adjustable time period.
- **Absence** The load is manually switched on. When the area is no longer occupied the load will automatically switch off after the adjustable time period has elapsed.

In either case, sensitivity to movement of the microwave sensor can be adjusted using the Sensitivity parameter.

HINT: To assist in setting the Sensitivity, turn on the Walk Test LED which will flash red when movement is detected.

Switch Level On/Off

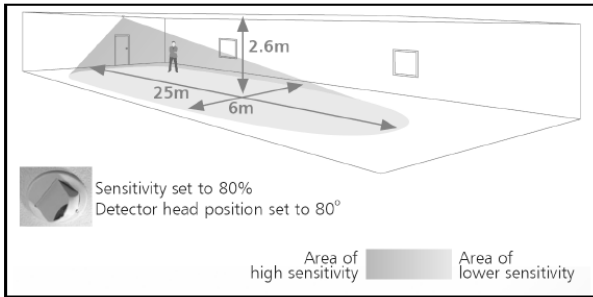
Occupancy detection can be made dependant on the ambient light level using the Lux On Level and Lux Off Level parameters.



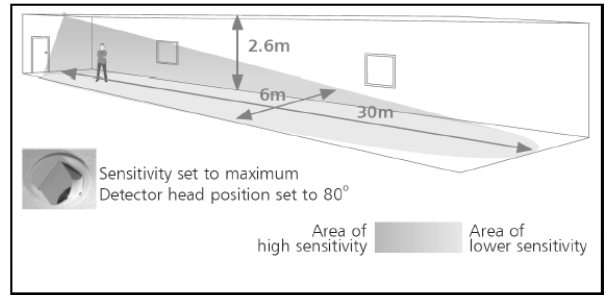
Maintained Illuminance (daylight harvesting)

The detector measures the overall light level in the detection area and calculates the correct output for the luminaires, to achieve a preset lux level (maintained illuminance or daylight harvesting).

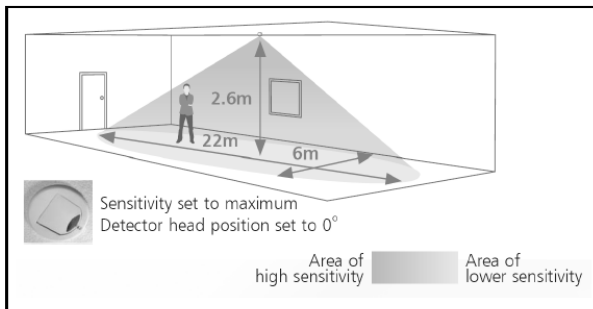
Detection diagrams



Ideal for large office or classroom



Ideal for corridor or aisle applications



Ideal for open plan areas and offices

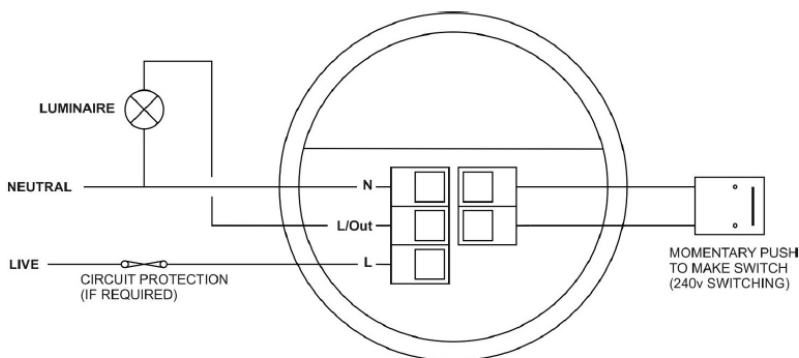
Note. If the range is compromised by the ceiling construction / material. Add the supplied 20mm spacer ring. See page 4 for fitting details.

Installation

Choosing a Suitable Location

The detector should be sited so that the occupants of the room fall inside the detection pattern shown opposite).

- Avoid positioning the unit where direct sunlight may enter the sensor element.
- Do not site the sensor within 1m of any lighting, forced air heating or ventilation.
- Do not fix the sensor to an unstable or vibrating surface.
- Avoid metallic objects directly in front of the sensor head.



Absence detection

- To use absence detection a retractive (momentary) switch must be connected between the 2 terminals on the diagram. Note that this will be switching mains voltage.
- The unit ships with presence detection as default. To change to absence detection, press and release the external switch 5 times within the first minute of power up. The LED will turn on solid for 30 seconds to indicate absence mode has been selected.
- To change back to presence detection, repeat the above procedure—the LED will flash for 30 seconds to indicate presence mode has been selected.

Note: the above adjustments can also be made using the UHS5 or UNLCDHS handsets. See Programming sections.

Power-up test procedure

When power is applied to the unit, the load will turn on immediately.

Set the timeout to 10 seconds, vacate the room or remain very still and wait for the load to switch off .

Check that the load switches on when movement is detected.

The unit is now ready for programming.

Read back function – Professional programming handset only (0041562)

The **0041562** has the ability to read back the settings stored in a device.

To read back individual parameters

- Navigate to the parameter and press the 'R' (Read) button whilst pointing at the device. The handset will click when the parameter has been read back, the device will flash its LED, and the value will be shown against the parameter in the menu.

To read back all of the parameters in a menu

- Press and hold the 'R' (Read) button for more than 1 second.
- The handset will click every time a parameter is received
- The device will show multiple flashes of its LED
- All of the values will be shown against the parameters in the menu.
- The individual parameters may be edited and then saved as a 'Macro'.

Notes

- *If a parameter(s) has been missed because of a communication error, the missing value(s) is replaced by dashes.*
- *When reading back, the Channel 1 relay (where fitted) will temporarily be switched off, and will return to it's normal state 2 seconds after the read back has been completed.*

Burn-in

Overview

It is a requirement of many fluorescent lamp manufacturers to have the lamps on at maximum output for a period of time to guarantee lamp life (refer to the manufacturer's datasheet for details) As this MWS3A-DD is able to dim the lamps using DALI/DSI, the product provides a facility to disable this for a given period of time.

Operation

By setting the "Burn in" parameter, you can select a time during which the lamps are not allowed to deviate from maximum output. The unit counts the time, and even remembers how long has elapsed in the event of a power failure. To cancel the burn in function, simply select a time of 0. Note that when the lamps are changed, the burn in time should be set again.

Installation

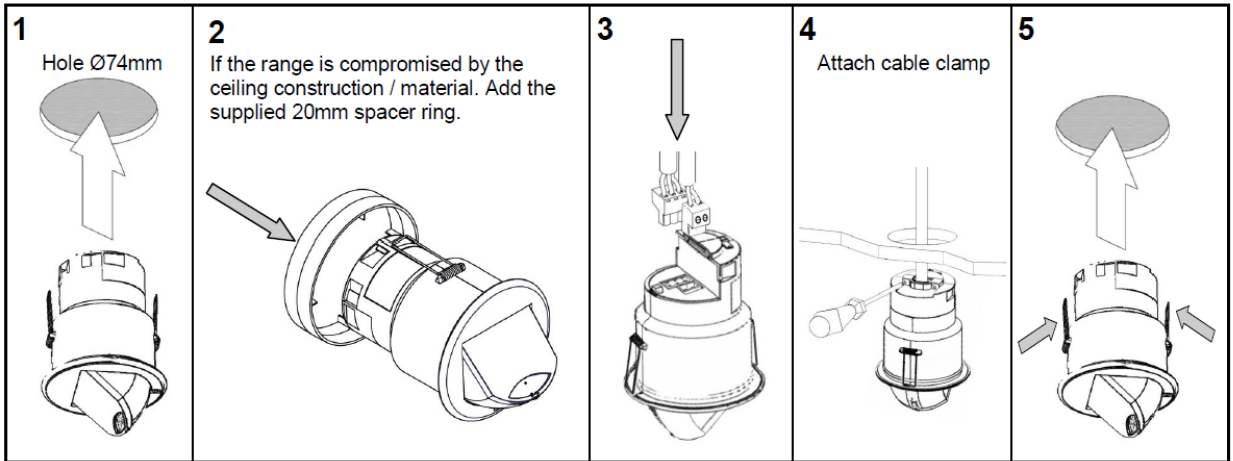
The **0041552** is designed to be mounted using either:

- Flush fixing, or
- Surface fixing, using the optional Surface Mounting Box (part no. **0041591**).

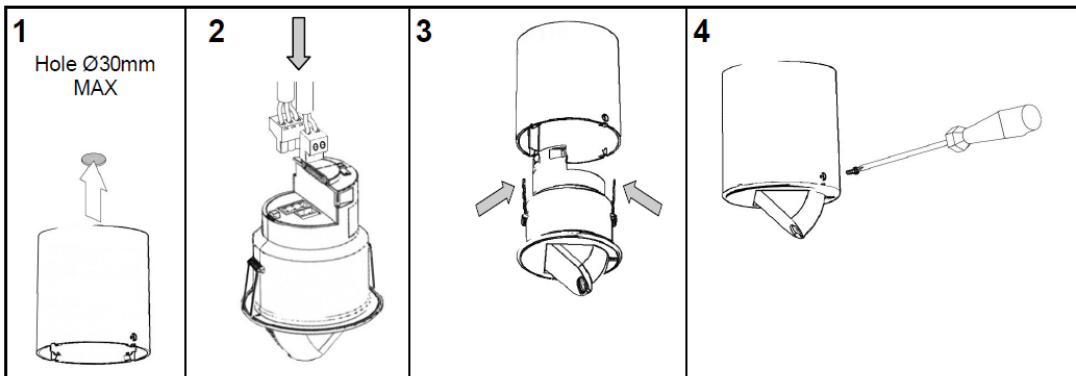
Both methods are illustrated below.

Warning - be careful bending springs when mounting unit.

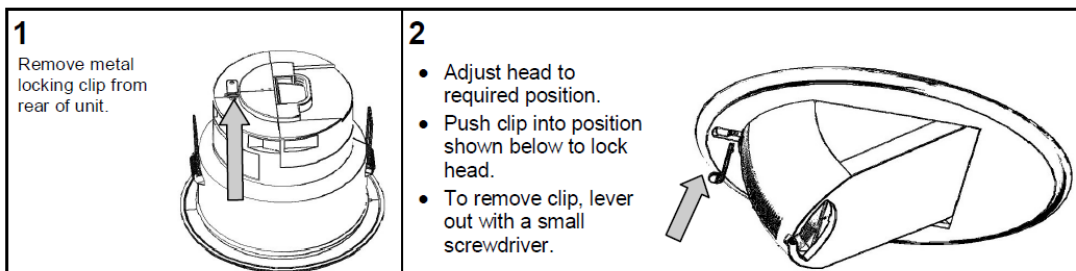
Flush fixing



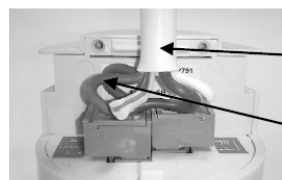
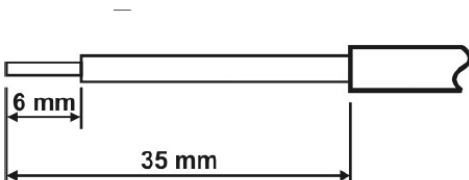
Surface fixing



Head locking



Wire stripping details



Important

Ensure that the cables are formed as shown before affixing the cable clamp. The clamp **MUST** clamp the outer sheath(s) only.

Bend cores as shown.

Wiring diagrams

Channel 1 (switched output) of the **0041552** can either be used to switch a separate channel of standard, non-dimming luminaires, or to isolate the mains supply to dimming ballasts (saving on the standby current of the ballasts).

Multiple luminaires may be connected in parallel to Channel 1 (via the **N** and **L/Out** terminals) as long as the maximum total load is not exceeded.

Channel 2 (dimnable output) of the **0041552** can be

used to control the light output of luminaires that are fitted with dimming ballasts/transformers.

The ballasts/transformers can be connected in parallel to Channel 2 (via the **DIM-** and **DIM+** terminals). Refer to the specification on page 12 for ballast quantities.

The wiring examples below show common methods of connecting the output channels for a single detector unit.

Single channel dimming

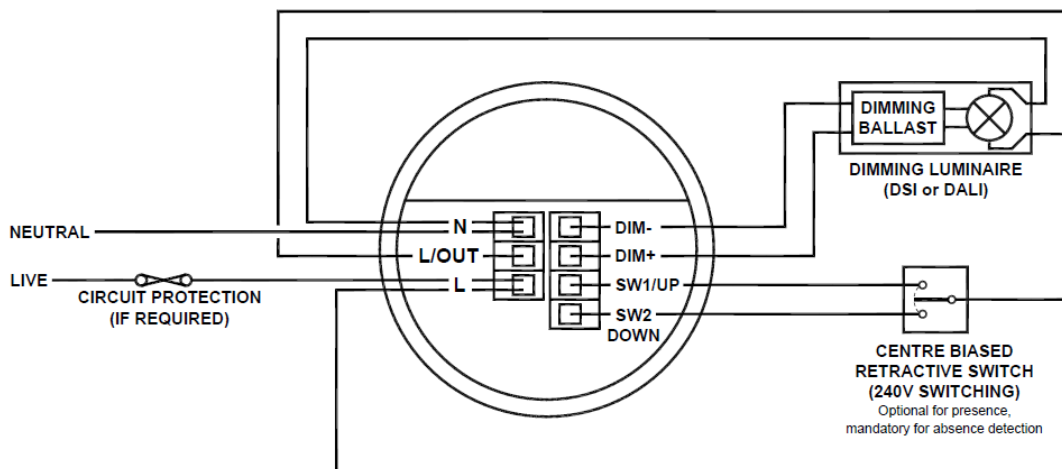
Functions: Switches the luminaire with occupancy and maintains illuminance. Dims and switches using optional centre biased retractive switch (MK K4900 or similar).

Configured to presence detection: Turns on automatically with occupancy. Maintains illuminance. Press and release down switch to turn off. Press and release up switch to turn back on. Press and hold up switch to dim up, press and hold down switch to dim down. Turns off after occupancy.

Configured to absence detection: Press and release up switch to turn on. Maintains illuminance. Press and release down switch to turn off. Press and hold up switch to dim up, press and hold down switch to dim down. Turns off after occupancy.

Channel mode: Set to "Switch and dim together".

Switch mode: Set to "2 position switch together".



Two channel, individual switches

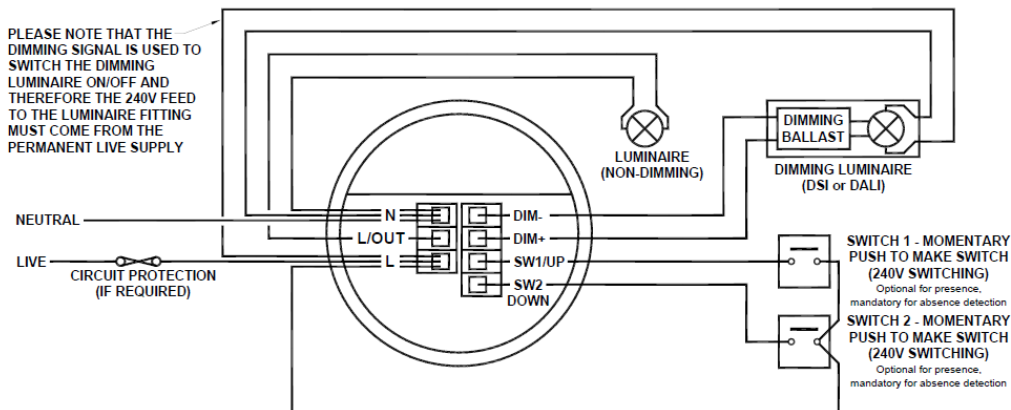
Functions: Switches both channels with occupancy. Maintains illuminance, dims and switches the dimming channel using optional single position retractive switch (switch 2). Switches the switching channel using the optional single position retractive switch (switch 1).

Configured to presence detection: Turns on automatically with occupancy. Maintains illuminance (dimming channel only). Press and release switch to toggle output. Press and hold switch to dim up and down (reverses direction with each press). Turns off after occupancy.

Configured to absence detection: Press and release switch to turn on. Maintains illuminance (dimming channel only). Press and release switch to turn off. Press and hold switch to dim up and down (reverses direction with each press). Turns off after occupancy.

Channel mode: Set to "Switch and dim separate"

Switch mode: Set to "1 position switch separate"



Two channel, single switch

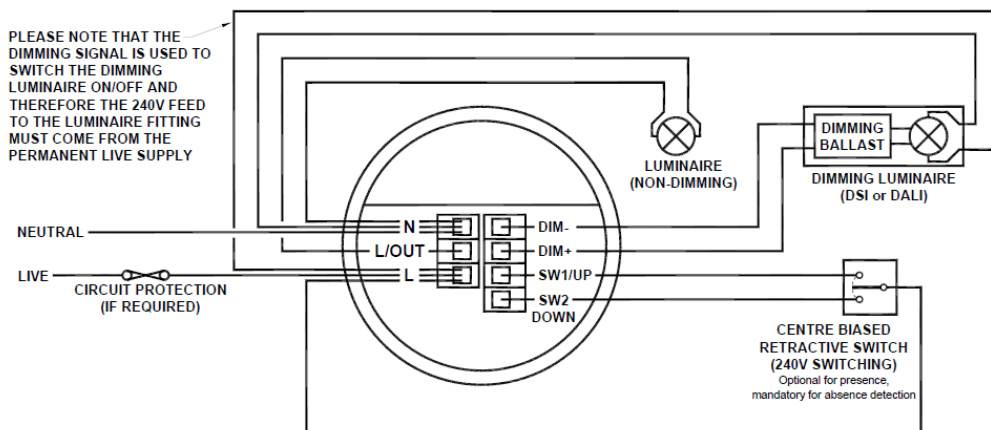
Functions: Switches both channels with occupancy. Maintains illuminance, dims and switches the dimming channel using optional centre biased retractive switch.

Configured to presence detection: Turns on automatically with occupancy. Maintains illuminance (dimming channel only). Press and release down switch to turn off. Press and release up switch to turn back on. Press and hold up switch to dim up, press and hold down switch to dim down. Turns off after occupancy. Channel 1 does not operate with switch.

Configured to absence detection: Press and release up switch to turn on. Maintains illuminance (dimming channel only). Press and release down switch to turn off. Press and hold up switch to dim up, press and hold down switch to dim down. Turns off after occupancy. Channel 1 does not operate with switch.

Channel mode: Set to "Switch and dim separate"

Switch mode: Set to "2 position switch separate"



PLEASE NOTE THAT THE CENTRE BIASED RETRACTIVE SWITCH WILL PROVIDE CONTROL FOR THE DIMMING LUMINAIRE(S) ONLY. THE NON-DIMMING LUMINAIRE(S) WILL BE CONTROLLED ONLY BY THE SENSOR

Wiring diagrams (cont.)

Single channel switching

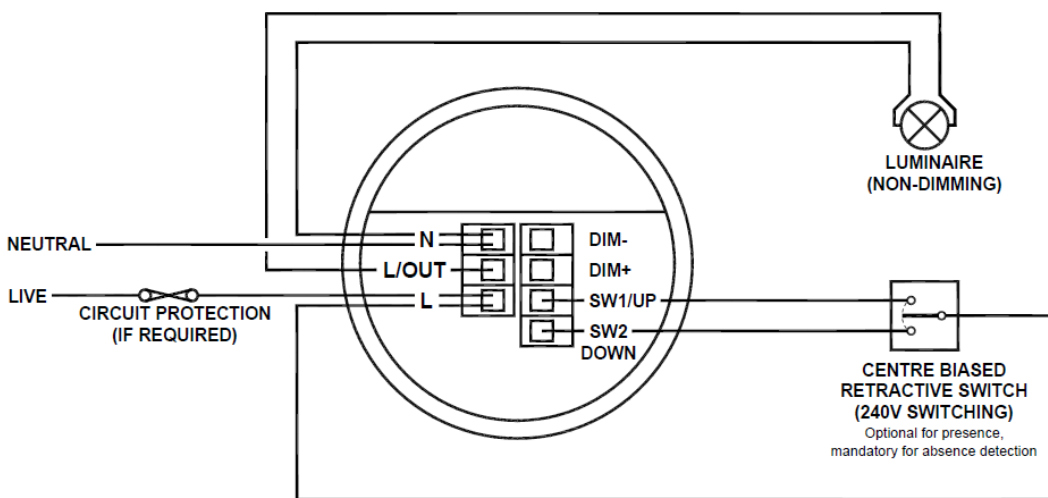
Functions: Switches channel 1 only with occupancy, optional override switch. No dimming output.

Configured to presence detection: Turns on automatically with occupancy. Press and release down switch to turn off. Press and release up switch to turn back on. Turns off after occupancy.

Configured to absence detection: Press and release up switch to turn on. Press and release down switch to turn off. Turns off after occupancy.

Channel mode: Set to "Switch only"

Switch mode: Set to "2 position switch together". Note: a single position switch can be used instead to toggle the output, set to "1 position switch separate".



Fault finding

What if the load does not turn ON?

- Check that the live supply to the circuit is good.
- Check that the load is functioning by bypassing the sensor (e.g. link terminals **L** and **L/ Out** on Channel1).
- If the detection range is smaller than expected, check the diagram on page 2. Adjusting the angle of the sensor head slightly may improve the detection range. If still reduced it may be compromised by the ceiling construction / material. Add the supplied 20mm spacer ring. See page 4 for fitting details.

HINT: The Walk Test LED function can be used to check that the unit is detecting movement in the required area.

What if the load does not turn OFF?

- Ensure that the area is left unoccupied for longer than the Time Out Period.
- Make sure that the sensor is not adjacent to vibrating surfaces or objects (e.g. ventilation equipment).
- The unit may pick up movement through glass, thin partitions or walls. Reduce the sensitivity.

Fault finding

What if the load does not turn ON?

- Strap across the L and LIVE OUT terminal to turn the load on
- If the supply and wiring are good, check the LUX level setting. Increase the LUX level setting to allow the controller to turn on at higher ambient natural light level.

What if the load does not turn OFF?

- Ensure that the area is left unoccupied for a greater time period than the time out period set using the switch.
- Make sure that the sensor is not adjacent to vibrating surfaces or objects (e.g. ventilation equipment).
- The unit may pick up movement through thin partitions or ceilings. Reduce the sensitivity.

Programming



The functionality of the 00415512 is controlled by a number of parameters which can be changed or programmed by any of the following devices:

- **Basic Programmer handset 0041546** – See instructions below
 - **Professional Programmer handset - 0041562** See user guide for full programming details.
- For most basic programming operations the UHS5 handset can be used and the following procedures are based on using this device.

Point the handset at the Sensor and send the required programming commands to the unit as shown below.

Valid commands will be indicated by a red LED flash. See page 1 for details of other LED responses.

Note: other functions on the 0041546 which are not shown below are not applicable to this product.

Parameter Name	Default Value	Number of Shift key presses				UHS5 Handset Graphics	Description
		0 SHIFT 1 SHIFT 2	1 SHIFT 1 SHIFT 2	2 SHIFT 1 SHIFT 2	3 SHIFT 1 SHIFT 2		
Button Activation							
On / Raise		On					Turn lights on.
Off / Lower		Off					Turn lights off.
Walk test	Off	On	Off				When set to On this causes a red LED to flash on the sensor when it detects movement. Use this feature to check for adequate sensitivity levels.
Time Out (Time adjustment)	10 mins	1, 10 & 20 minutes	5, 15 & 30 minutes				Once the detector is turned on, this value sets how long the lights will stay on once movement has ceased.
Lux on level (Switch level on)	9	2, 5 & 7	4, 6 & 9				Lux level setting to prevent the luminaires being switched on if the ambient light level is sufficient (adjustable between 1 and 9). The luminaires will always be switched on at level 9.
Lux off level (Switch level off)	9	2, 5 & 7	4, 6 & 9				Lux level setting to switch the luminaires off during occupancy if the ambient light level goes above the setting (adjustable between 1 and 9). Level 9 will always keep the lights on. This setting can be used for "window row switching".
Sensitivity	9	1, 5 & 9	3, 6 & 8				Sensitivity level for detecting movement. 1 = low sensitivity 9 = high sensitivity
Defaults			D				Returns the unit to the default settings.
Shift							Use this button to select the settings in red and blue signified by the 'Shift 1' and 'Shift 2' LEDs

Advanced programming

Parameter Name	Default Value	Range / Options	Description	0041546	0041562
Detector Parameters					
Walk Test LED	Off	On or Off	When set to On this causes a red LED to flash on the sensor when it detects movement. Use this feature to check for adequate sensitivity levels.	✓	✓
Time Out (Time adjustment)	20 minutes	0-99 minutes	Once the detector is turned on, this value sets how long the lights will stay on once movement has ceased. Select 0 for 10 second delay – use for commissioning only.	✓	✓
Manual Time Out	10 minutes	0-99 minutes	When a manual operation occurs, either via the switch input or the infrared, it invokes the timeout period. Example 1: a detector in presence mode has a detector timeout of 15 minutes and a manual timeout of 3 minutes. When the user leaves the room they press the off button. The sensor will revert to automatic after 3 minutes, and then walking back in the room will turn the lights on. Example 2: using the settings above, the user turns the lights off (say for a presentation) but stays in the room. Every time a movement is detected, the manual timeout period is re-triggered, but when it doesn't pick up for the short timeout period, the sensor will timeout and revert to automatic. This means the lights may turn on inadvertently during the presentation, if the occupants are still for the manual timeout period, so adjust the timing carefully.	✗	✓
Sensitivity On	9	1 (min) to 9 (max)	Sensitivity level for detecting movement when the detector is already on. 0041546 sets Sensitivity On and Off to the same value.	✓*	✓
Sensitivity Off	9	1 (min) to 9 (max)	Sensitivity level for detecting movement when the detector is off. *0041546 sets Sensitivity On and Off to the same value.	✓*	✓
Lux time	0	0 (disabled) 1-99 minutes	If the detector measures the lux level and decides that the output needs switching on or off as a consequence, the lux time must elapse first. If at any time during the timed delay the lux change reverses then the process is cancelled. Lux Time enables absence detection to be implemented with a lux off level set. When the button is pressed, the lights will go on, regardless of ambient light level. However, if there is sufficient ambient light, they will turn off again after the Lux Time. <i>Note that whenever the an external switch is pressed, whether in absence or presence mode, if the lights were out because of the lux level, they will be immediately turned on again for at least the Lux Time.</i>	✗	✓
Power Up State	On	On or Off	Select No for a 30 second delay on start up. If Yes is selected, there will be no delay on start up and the detector will always power up detecting.	✗	✓
Disable Detector	N	Y or N	Disables detection, leaving the relay output permanently off with the dimming output operational. This mode is used when the unit is for maintained illuminance only.	✗	✓
On Delay	0 minutes	0-99 minutes	The On Delay to allows the first channel to switch on after the second channel. A typical application for this would be where a detector is controlling lighting and air conditioning in an area. When the occupant is detected, the lighting will be turned on immediately, whereas the air conditioning may be turned on after 15 minutes. If the area is vacated and the detector times out before the delay, then the air conditioning would never go on. The delay can be set only for channel 1 using the on delay parameter.	✗	✓
Inhibit	4 seconds	1 to 99 seconds	When the detector turns off, a delay is instigated to prevent retriggering. In certain circumstances this delay may not be enough. This parameter allows the delay to be changed.	✗	✓
Factory default	-	-	Restores factory default settings	✓	✓

Channel Modes					
Switch only	-	-	Usually used for absence detection - in this mode the dimming channel is not used.	✗	✓
Switch and dim together	Default	-	The detector will switch and dim the lighting together.	✗	✓
Switch and dim separate	-	-	Provides 2 channel operation – Channel 1 is switched via the relay output, and Channel 2 is dimmed / switched via the dimming output.	✗	✓

User Modes					
Raise	-	-	Increase light level. Reverts when occupancy cycle complete.	✓	✓
Lower	-	-	Decrease light level. Reverts when occupancy cycle complete.	✓	✓
Override On	-	-	If the lights are off, sending the IR command will turn them on immediately and revert to automatic operation using the manual timeout period.	✓	✓
Override Off	-	-	If the lights are on, sending the IR command will turn them off immediately. After the manual timeout period (described above), the sensor will revert to automatic.	✓	✓
Cancel	-	-	Cancels the on or off override, returning the detector to normal operation.	✗	✓

Advanced programming

Parameter Name	Default Value	Range / Options	Description	0041546	0041562
Channel 1 -Switching Channel					
Detection Mode	Presence	Presence or Absence	Presence mode allows the output to turn on when movement is detected and off when movement ceases. Absence mode allows the output to turn off when movement ceases, but must be manually turned on first.	✓	✓
Lux on level (Switch level on)	9	1 to 9 For a higher resolution a scale of 101-199 is available	Sets a minimum light level below which the microwave sensor is enabled, allowing lights to be turned on by movement. <i>Note: the Lux Level Off value must always be greater than the Lux Level On value.</i>	✓	✓
Lux off level (Switch level off)	9	1 to 9 For a higher resolution a scale of 101-199 is available	Sets a maximum light level above which the microwave sensor is disabled, preventing lights from being turned on by movement.	✓	✓

Channel 2 -Dimming Channel					
Detection Mode	Presence	Presence or Absence	Presence mode allows the output to turn on when movement is detected and off when movement ceases. Absence mode allows the output to turn off when movement ceases, but must be manually turned on first.	✓	✓
Lux on level (Switch level on)	9	1 to 9 For a higher resolution a scale of 101-199 is available	Sets a minimum light level below which the microwave sensor is enabled, lights to be turned on by movement. <i>Note: the Lux Level Off value must always be greater than the Lux Level On value *0041546 sets</i>	✓	✓
Lux off level (Switch level off)	9	1 to 9 For a higher resolution a scale of 101-199 is available	Sets a maximum light level above which the microwave sensor is disabled, preventing lights from being turned on by movement.	✓	✓
Light Level (maintained illuminance)	600	1 to 998 (999 disabled)	Sets a target light level to be maintained by the lighting system.	✓	✓
Load Type	DALI	DSI DALI DALI On	Sets the ballast control protocol to DSI. Sets the ballast control protocol to DALI. DALI On provides a permanent voltage to DALI ballasts when DALI has not been implemented correctly in the ballast. Maximum number of ballasts is 5 unless the relay is disabled then it is 10.	✓ ✓ ✗	✓ ✓ ✓
Max Value	100%	0 to 100%	Maximum dimming output level.	✗	✓
Min Value	0%	0 to 100%	Minimum dimming output level.	✗	✓
On value	99	0 to 99	Dimming output level when switched on (0-99).	✗	✓
Off value	0	0 to 99	Dimming output level when switched off (0-99). If a non-zero off value is set, then the output will toggle between this value and completely off depending on the switch level on and off values. For example, if it is light outside, the fittings will be off if there is no occupancy. If it is dark outside, they will adopt the preset off value. This feature is only enabled if 'Min value' is set to 99.	✗	✓
Burn-in	0	0 (disabled) or 1 to 999 hours	Determines how long the output will be at 100% so that lamps 'burn-in'. The 'burn-in' time is not affected by power supply interruptions.	✓	✓
Fade value	10	0 to 99	After occupancy ceases, this dimming output level is loaded for the fade time (adjustable between 0 and 99).	✗	✓
Fade mins	0	0 to 99	This is the time period (adjustable between 0 and 99 minutes) that the luminaire will be held at the fade value before turning off. A value of 0 disables the fade function.	✗	✓
Speed On	40	Measured in 0.1 sec intervals.	Determines the dimming response speed after the setup time has finished.	✗	✓
Speed Set	5	Measured in 0.1 sec intervals.	Determines the dimming response speed during the set up time. Measured in 0.1 sec intervals. If set to 0 will disable dimming for "Set seconds" below, used if fittings are required to warm up before dimming.	✗	✓
Set Seconds	120	1 to 999 seconds	Determines how long the dimming response set-up period lasts on power-up or on setting change. This enables the desired lux level to be achieved rapidly when the lights come on, or during setup.	✗	✓

Switch Modes					
2 position switch together	Default	-	A single centre biased retractive switch will be used to control both channels together.	✗	✓
2 position switch separate	-	-	A single centre biased retractive switch will be used to control only the dimming channel.	✗	✓
1 position switch together	-	-	A single position retractive switch controls both channels together.	✗	✓
1 position switch separate	-	-	Two single position retractive switches, controlling the channels separately.	✗	✓

Technical data

Dimensions
Weight
Supply Voltage
Frequency
Maximum Load

See diagrams opposite
0.15kg
230VAC +/- 10%
50Hz
Channel 1 (switching):
10A of lighting and/or ventilation including incandescent, fluorescent, compact fluorescent, low voltage (by switching the primary of transformer).
Channel 2 (dimming):
Maximum number of DSI or DALI ballasts is 10 unless the relay is disabled then it is 20.

Power consumption
Dimming output

On 1500mW, Off 961mW
Basic insulation only. Although low voltage, this is not an SELV output and should be treated as if mains potential. Use mains rated wiring.

Terminal Capacity
Temperature
Humidity
Material (casing)
Type

2.5mm²
-10°C to 50°C
5 to 95% non-condensing
Flame retardant ABS and PC/ABS
Class 2

Safety

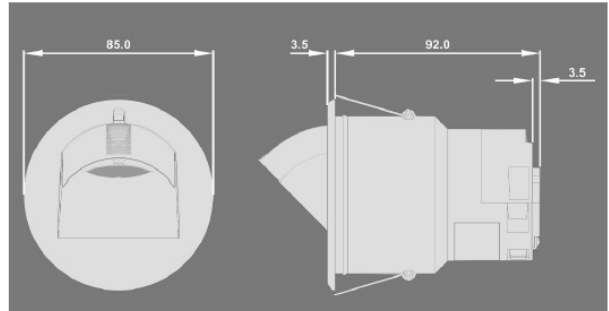
The microwave radiation emitted by these units is extremely low power and complies with ANSI standard "IEEE C95.1-1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields 3kHz 300GHz."

IP rating
Compliance

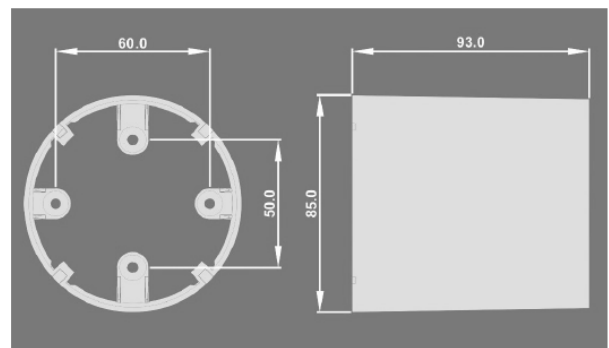
IP40
EMC-2004/108/EC
LVD-2006/95/EC



0041552



0041591



Frequency compatibility

The allowable frequency of operation of this product is different depending on region. Please select the correct order code using the table below.

Zone	Region	Frequency
Blank (1)	UK, China, India, Middle East, Malaysia, Hong Kong, Singapore	10.687GHz
2	Australia and all of Europe <i>except</i> : UK, France, Portugal, Germany, Switzerland, Austria, Slovak Republic, Republic of Ireland	10.525GHz
3	France, Portugal, Switzerland	9.900GHz
4	Germany, Austria, Slovak Republic	9.350GHz
5	Republic of Ireland	10.41GHz