Quick Start: **MoLiTe sensor EU**

Technical specifications

Normal operating voltage	2x AA 1,5V batteries
Normal battery lifetime	5 years
Frequency range	868.42 MHz
Wireless range	Min 150 meters in a mesh network
Temperature sensor accuracy	+/- 2,5° C from -15° C to +85° C
Motion sensor range	Max. 10 meters under a 110° angle

Movement sensor

Light and temperature sensor

Indicator light

Basic operations

- The *MoLiTe* can detect **movement,**
- The *MoLiTe* can measure **light** intensity
- The *MoLiTe* can measure the **temperature**
- The *MoLiTe* can trigger a security system

How it operates

After a successful inclusion the *MoLiTe* can be mounted on the wall directly or with a bracket.
When movement is detected the indicator light will blink shortly, this indicates that a Z-Wave message has been send successfully.
With a controller you can request the temperature and battery level.

Mounting

1. Before mount, the *MoLiTe Sensor* should be included into a Z-Wave network and associated.
2. Use a flat screwdriver at the inlets on the sides to gently unlock the back cover.
3. Use the supplied screws to mount the cover or bracket to the wall.
   For optimal use, mount the *MoLiTe* between 1,5m and 2,5m above ground.
   (A rotating bracket is available to adjust the direction the *MoLiTe* is pointing to).
4. Place two AA 1,5V batteries into the device.
5. Mount the *MoLiTe* onto the back cover and be sure to close it on all sides.
6. Mounting is completed when the led blinks for a full second.
7. The MoLiTe sensor has to start up for circa 10 seconds.
8. After circa 10 seconds the MoLiTe is ready for detection.
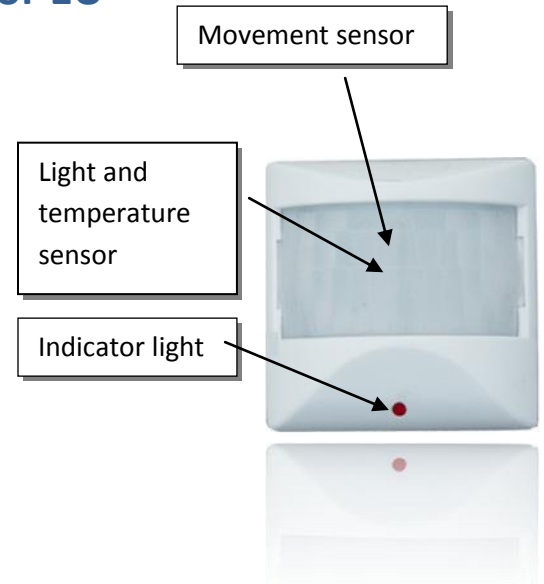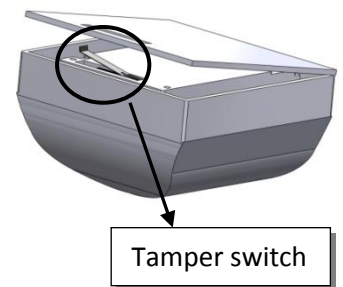
Tamper switch

Include or exclude in Z-Wave network [1]

1. When the *MoLiTe* is mounted, remove it from the back cover.
2. Press and hold the *tamper switch* for 2 seconds and release to start the inclusion or exclude process.
3. When classic inclusion failed, the product will start Network Wide Inclusion automatically.

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[1] Make sure your Z-Wave controller is in de correct operation mode (include or exclude).

Technical Manual: **MoLiTe Sensor EU**

Caution:
- This device is using a radio signal that passes through walls, windows and doors. The range is strongly influenced by local conditions such as large metal objects, house wiring, concrete, furniture, refrigerators, microwaves and similar items. On average, the indoor range is approximately 30 meters.
- Do not expose this product to excessive heat or moisture. Dry location use only.
- Prevent long term ex posure to direct sunlight.
- Do not attempt to repair this product. If the product is damaged or if you are in doubt about the proper operation, take the product back to the place of purchase.
- Do not clean the product with any liquid.
- Indoor use only.

Technical details

Normal operating voltage	2x AA 1,5V batteries From 2,3 to 4,0V Do not use rechargeable batteries
Battery lifetime	Approximately 5 years (with Eco mode for >8hours a day) Normal usage will give approximately 3 years lifetime Notice: long and big networks will increase the battery lifetime
Frequency range	868.42 MHz (EU) others on request
Wireless range	Approximately 100 meters in line of sight Min. 150 meters with a good mesh network (max. 4 hops)
Temperature sensor accuracy	+/- 2,5° C from -15° C to +85° C **
Light sensor accuracy	Steps of 10% from dark until sunlight
Motion sensor range	Max. 10 meters under a 110° angle
Storage temperature	-5°C to +65°C
Storage humidity	10% to 70%
Operating temperature	0°C to 50°C
Operating humidity	10% to 80%

**Offset of the temperature ADC measurement must be calibrated with the z-wave configuration command class.

Product dimensions (length x width x height)
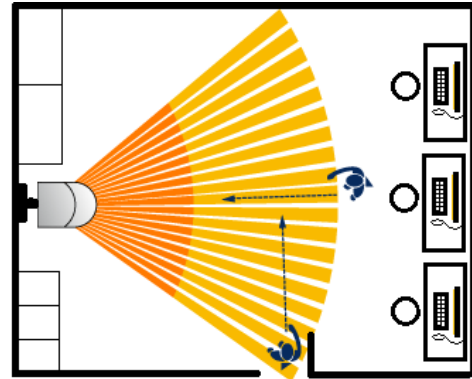
MoLiTe Sensor = 62 x62 x 38 mm

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Detailed instruction

We advise the *MoLiTe* to be mounted between 1,5m and 2,5m from the ground, flat on the wall and not facing down. With an optional bracket, the direction the *MoLiTe* is points at can be changed (up/down and left/right). The *MoLiTe* detects movement up to 10 meters. Without bracket attached, it is recommended to place to *MoLiTe* in the middle of the wall (see 'Good sensor positioning').
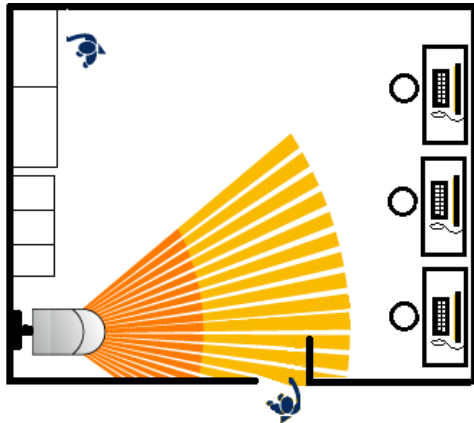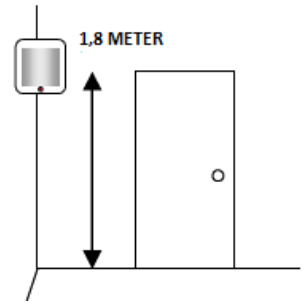
Bad sensor positioning (poor area coverage)   **Good sensor positioning**

Indication mode

The indicator light gives various statuses of the device as follows:

1. Ready for learn mode: indicator light blinks every second
2. Learn in progress (add):   indicator light 2 times every second
3. Learn in progress (remove):   indicator light 3 times every 1.5 second
4. Learn mode success: indicator light is on for one second
5. Tamper released   indicator light blinks 6 times rapidly
6. Mounting successful   indicator light is on for 1 second
7. RF message send failed   indicator light blinks 6 times rapidly

Supporting command classes

Basic type: BASIC_TYPE_ROUTING_SLAVE
Generic type: GENERIC_TYPE_SENSOR_BINARY
Specific type: SPECIFIC_TYPE_NOT_USED
Listening: False, Z-Wave Lib: 4.54

class: 0x30 COMMAND_CLASS_SENSOR_BINARY
class: 0x31 COMMAND_CLASS_SENSOR_MULTILEVEL_V5
class: 0x70 COMMAND_CLASS_CONFIGURATION
class: 0x71 COMMAND_CLASS_ALARM
class: 0x72 COMMAND_CLASS_MANUFACTURER_SPECIFIC
class: 0x80 COMMAND_CLASS_BATTERY
class: 0x84 COMMAND_CLASS_WAKE_UP
class: 0x85 COMMAND_CLASS_ASSOCIATION

class: 0x86 COMMAND_CLASS_VERSION
class: 0xEF COMMAND_CLASS_MARK
class: 0x20 COMMAND_CLASS_BASIC

Not listening routing slave
This Z-Wave product will be used as routing slave. Slave nodes are nodes in a Z-Wave network that receive commands and perform actions based on the command. This device will always be in sleep mode because it works on batteries. In sleep mode the device is not active listening, the device will wake up according to the wakeup command class.

Include initiator
The include initiator is used when Primary and Inclusion Controllers include nodes into the network. When both the include initiator have been activated simultaneously the new node will be included to the network (if the node was not included previously).

Exclude initiator
The exclude initiator is used by Primary Controllers to exclude nodes from the network. When the exclude initiator and a slave initiator are activated simultaneously, it will result in the slave being excluded from the network (and reset to Node ID zero). Even if the slave was not part of the network it will still be reset by this action.

Z-Wave compatibility
Because this is a Z-Wave device, it means it can co-operate with other Z-Wave devices of other manufacturers. It can co-exist in a Z-Wave network existing with product from other manufacturers.

Hops & retries
The Z-Wave range has a range of up to 30 meters in line of sight. This signal is not limited to the 30 meter range due to routing the Z-Wave message to other nodes in the network. This way the range of the Z-Wave network can be expanded to 150 meters indoors (limit of 4 hops).

class 0x20 COMMAND_CLASS_BASIC
When movement is detected a basic set frame with value 255 is sent to the associated nodes. If the configured time is done with no movement is detected a basic set frame with value 0 is sent to the associated nodes. This is the controlling role of the basic command class.

The supporting role of the Basic command class is mapped to the Sensor Binary command class.

class: 0x30 COMMAND_CLASS_SENSOR_BINARY
The Sensor Binary Command Class can be used to check if motion is detected, value 0 means that there is no motion detected and therefore a associated node is off, value 255 means that a associated node is on.

Class: 0x80 COMMAND_CLASS_BATTERY
This class is used to request and report battery levels for a given device.
When the battery level is lower than 20%, the MoLiTe will send a battery warning (value 255) after every wake up notification. A battery get will report the actual value even if it is below 20%.

An unsolicited (without receiving a BATTERY_GET) BATTERY_REPORT is sent when the MoLiTe Sensor has measured that the battery level has dropped.

Note that the following points apply for the unsolicited BATTERY_REPORT
- When new batteries applied a report is sent with the current value
- The report will always be lower then the previous sent value
- The battery level in the report is maximum 2% lower then the previous sent value

class: 0x86 COMMAND_CLASS_VERSION

This command class is used to obtain information about the *MoLiTe*. The Z-Wave library type, the Z-Wave protocol version and the application version will be reported.

Because the version 2 is supported this command class can also be used to request the serial number of the device with the DEVICE_SPECIFIC_GET command.

class: 0x72 COMMAND_CLASS_MANUFACTURER_SPECIFIC

This will report information about the manufacturer. This product will contain the manufacturer ID of *BeNext*.

Manufacturer ID of *BeNext* is 138, the ID of this product is 4.

class: 0x70 COMMAND_CLASS_CONFIGURATION

Configure parameters:

0. **Not used**
1. **Set to default**
   Description: Set all config values to default values (factory settings). Read more in
                            the chapter Configuration Reset.
   Size: 1 byte*
   Param1:   if 0xFF then set to default
   Param2,3,4:   Not used

2. **Mode timeout**
   Description: The time used in mode 2 to turn the sensor off. This
                            time will start running as soon as detection is seen.
   Default value: 0x0384 = 900 sec = 15 min

   Size: 2 bytes (integer)*
   Param1:   The most significant byte of the integer
   Param2:   The least significant byte of the integer
   Param3,4:   Not used

3. **Switch off time**
   Description: The switch off time will start running as soon as mode timeout is done.
                            The Motion sensor is turned on and when movement is
                            detected again. The mode timeout (cfg param 1) will start running all
                            over again.
                            When switch off time is done a basic off message is sent to the
                            associated node.
   Default value: 0x0A8C = 2700 sec = 45 min.

   Size: 2 bytes (integer)*
   Param1:   The most significant byte of the integer
   Param2:   The least significant byte of the integer
   Param3,4:   Not used

4. **Sensitivity**
    Description: the sensitivity of the motion circuit
    Default: 0x50 = 80

    Size: 1 byte*
    Param1:   Sensitivity value between 0 and 127 (values above 127 will be reported as the set value but will be handled in SW as 127).
                                0 is least sensitive and 127 are most sensitive.
    Param2,3,4:   Not used

5. **the mode**
    Description: The mode that is entered after detection
    Default: 0x02

    Size: 1 byte*
    Param1:   mode 1, 2 or 3.
                                Mode 1: no detection possible. Battery save mode.
                                Mode 2: normal operation mode: send on after detection and off after given time no detection.
                                Mode 3: Z-Wave chip is always on to request e.g. version or manufacturer ID.
                                If mode is 0 or higher than 3, that value will be reported after a get but will be handled in SW as mode 2.
    Param2,3:   Not used

6. **The temperature offset**
    Description: An offset for the temperature.
    Default: 0x00

    Size: 2 bytes*
    Param1,2:   A signed integer to determine the offset off the temperature
    Param3,4:   Not used

7. **Light table 100 %**
    Description: If a LDR resistance measured lower then this value the returned light percentage is 100%. See chapter light table for more information.
    Default: 0x0011

    Size: 2 bytes*
    Param1,2:   A unsigned integer that represents the LDR resistance value
    Param3,4:   Not used

8. **Light table 90 %**
    Description: If a LDR resistance measured lower then this value the returned light percentage is 90%. See chapter light table for more information.
    Default: 0x0026

    Size: 2 bytes*
    Param1,2:   A unsigned integer that represents the LDR resistance value
    Param3,4:   Not used

9. **Light Table 80 %**
   Description: If a LDR resistance measured lower than this value the returned light
                                   percentage is 80%. See chapter light table for more information.
   Default: 0x0055

   Size: 2 bytes*
   Param1,2:   A unsigned integer that represents the LDR resistance value
   Param3,4:   Not used

10. **Light Table 70 %**
    Description: If a LDR resistance measured lower then this value the returned light
                                   percentage is 70%. See chapter light table for more information.
    Default: 0x00BA

    Size: 2 bytes*
    Param1,2:   A unsigned integer that represents the LDR resistance value
    Param3,4:   Not used

11. **Light Table 60 %**
    Description: If a LDR resistance measured lower then this value the returned light
                                   percentage is 60%. See chapter light table for more information.
    Default: 0x0197

    Size: 2 bytes*
    Param1,2:   A unsigned integer that represents the LDR resistance value
    Param3,4:   Not used

12. **Light Table 50 %**
    Description: If a LDR resistance measured lower then this value the returned light
                                   percentage is 50%. See chapter light table for more information.
    Default: 0x037B

    Size: 2 bytes*
    Param1,2:   A unsigned integer that represents the LDR resistance value
    Param3,4:   Not used

13. **Light Table 40 %**
    Description: If a LDR resistance measured lower then this value the returned light
                                   percentage is 40%. See chapter light table for more information.
    Default: 0x079D

    Size: 2 bytes*
    Param1,2:   A unsigned integer that represents the LDR resistance value
    Param3,4:   Not used.

14. **Light Table 30 %**

Description:	If a LDR resistance measured lower then this value the returned light percentage is 30%. See chapter light table for more information.
Default:	0x10A9
Size:	2 bytes*
Param1,2:	A unsigned integer that represents the LDR resistance value
Param3,4:	Not used

15. **Light Table 20 %**

Description:	If a LDR resistance measured lower then this value the returned light percentage is 20%. See chapter light table for more information.
Default:	0x2474
Size:	2 bytes*
Param1,2:	A unsigned integer that represents the LDR resistance value
Param3,4:	Not used

16. **Light Table 10 %**

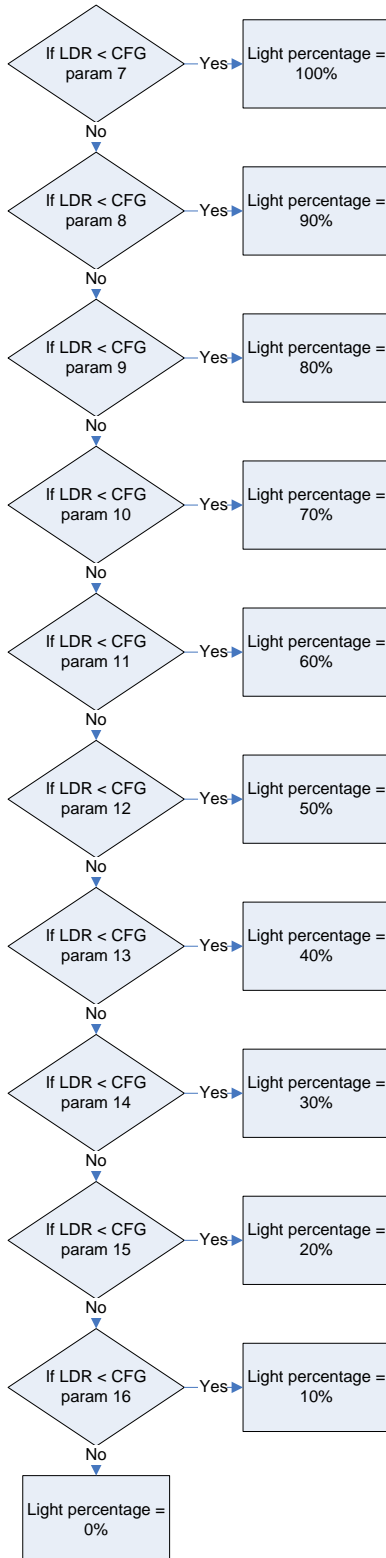|	
Description:	If a LDR resistance measured lower then this value the returned light percentage is 30%. See chapter light table for more information.
Default:	0x4FC1
Size:	2 bytes*
Param1,2:	A unsigned integer that represents the LDR resistance value
Param3,4:	Not used

* If a size is other then given size the frame is ignored totally so configuration values are **not** changed.

Light table

It is possible to configure a light table to set the sensitivity of the integrated light sensor. The more light the LDR receives, the lower the resistance is. The percentage of light is determined as follows.

```
If LDR < CFG param 7 ──Yes──▶ Light percentage = 100%
        │
        No
        ▼
If LDR < CFG param 8 ──Yes──▶ Light percentage = 90%
        │
        No
        ▼
If LDR < CFG param 9 ──Yes──▶ Light percentage = 80%
        │
        No
        ▼
If LDR < CFG param 10 ──Yes──▶ Light percentage = 70%
        │
        No
        ▼
If LDR < CFG param 11 ──Yes──▶ Light percentage = 60%
        │
        No
        ▼
If LDR < CFG param 12 ──Yes──▶ Light percentage = 50%
        │
        No
        ▼
If LDR < CFG param 13 ──Yes──▶ Light percentage = 40%
        │
        No
        ▼
If LDR < CFG param 14 ──Yes──▶ Light percentage = 30%
        │
        No
        ▼
If LDR < CFG param 15 ──Yes──▶ Light percentage = 20%
        │
        No
        ▼
If LDR < CFG param 16 ──Yes──▶ Light percentage = 10%
        │
        No
        ▼
Light percentage = 0%
```

The default configurations values represent a standard table. If you prefer a dark sensitivity then a table with high values is advised and for a light sensitivity low values.

class: 0x31 COMMAND_CLASS_SENSOR_MULTILEVEL_V5

The Sensor Multilevel command class is used to get a report from the MoLiTe. The returned value is the measured temperature inside the housing with one decimal.

Because it is version 5 it is necessary to give the sensor type to the SENSOR_MULTILEVEL_GET frame to obtain the preferred sensor multilevel value.

Sensor type 1: Temperature
Sensor type 3: Light

NOTE: If a requesting devices only supports sensor multilevel < version 5 it is not possible to give a sensor type to the request. In this case the temperature value is reported but it is not possible to request the light value.

class: 0x85 COMMAND_CLASS_ASSOCIATION

The Association command class is used to associate other devices with the *MoLiTe*. The devices that are associated can be controlled on application level. Every node associated in the group will be switched on with a BASIC_SET very time motion is detected.

Number of groupings: 1
Maximum supported nodes per group: 5

Because only one group is supported grouping identifier is ignored in all cases.

class: 0x84 COMMAND_CLASS_WAKE_UP

The Wake Up command class is used at battery-operated devices. This class allows the *MoLiTe* to wake up occasionally to notify others devices, that the *MoLiTe* is ready to receive commands. After receiving the commands the *MoLiTe* will go into sleep mode again. The wake up interval can be set using the WAKE_UP_INTERVAL_SET command.

The default value is 0x1C20 = 7200 sec = 2 hour
The default node is 0xFF = 255 (broadcast)

It is possible to send a **wake up notification** on user interaction. To do this press and hold the tamper switch for four seconds (mount the device).
When the wake up time is set to 0 a **wake up notification** is never send periodically, only on user interaction.

class: 0x71 COMMAND_CLASS_ALARM

This command class is used to identify the state of the tamper alarm. The device will send an unsolicited report to the controller if the status is changed, the value 0x00 will indicate that the tamper is placed correctly on the wall. The value 0xFF will indicate a tamper alarm.

There is one alarm type:
3: Tamper switch

Every other alarm type that is requested will be ignored by application.

Configuration reset

The MoLiTe supports a configuration reset function. Configuration reset means:
- All configuration values are defaulted
- Wake up interval is defaulted

Note: All configurations will also be defaulted after exclusion the device.

This function can be activated by sending a configuration set frame:

CONFIGURATION_SET
Parameter: 0x01
Size: 0x01 (can't be different from 1)
Value: 0xFF (can be any value except for 0x55 or 0xAA)

When the value of configuration value is requested 2 possible values can be returned.

CONFIGURATION_REPORT
Parameter: 0x01
Value 0x55:   Device doesn't have all his default configuration settings anymore.
                  Even when a configuration parameter is changed back to the default value
Value 0xAA: Devices still has all his factory settings.
                  This are only configuration parameters, wake up interval can be changed.

Always awake mode

The always awake mode is used to request different values from the device e.g. version and manufacturer specific.

The always awake mode can be activated by:

CONFIGURATION_SET
Parameter: 0x05
Size: 0x01 (can't be different from 1)
Value: 0x03 (mode 3)

The always awake mode can be deactivated by:

CONFIGURATION_SET
Parameter: 0x05
Size: 0x01 (can't be different from 1)
Value: Any value except 3

A second option to deactivate mode 3 is:
1. Remove batteries
2. Wait ca 10 seconds
3. Replace batteries

Note: in always awake mode the batteries will be drain very fast, we do not recommend to use this mode.

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Frequently Asked Questions

Q: I can't have my *MoLiTe* included into my Z-Wave network, what am I doing wrong?

A: **1**. Is the controller ready to include any device into the Z-Wave network? If the controller is not in Include or exclude mode, the *MoLiTe* can not be included or excluded.
          2. The *MoLiTe* is already included in a Z-Wave network. Exclude the *MoLiTe* and Try to include it again.

Q: Why doesn't the *MoLiTe* detect any movement?

A: **1**. The *MoLiTe* isn't included in a Z-Wave network. Include it and try it again.
          2. The batteries are almost empty, try putting new ones in.

Q: The temperature report of the *MoLiTe* is incorrect.

A: **1**. The *MoLiTe* is placed directly in the sun, which makes the temperature in the housing of the *MoLiTe* hotter than elsewhere in the room.
          2. The calibration is not the same as your other temperature sensor, it is possible to do a re-calibration of the temperature sensor with MyBeNext and the Internet Gateway.

Q: I have configured a value but when I request it, it is not changed?

A: It is mandatory that the correct size is used while configure a parameter; go to the documentation about the configuration command class to check if the right size is used during configuration. If the wrong size is used the frame is ignored totally.

Q: I have configured a new value and when I request it the correct value is returned but the behavior is still the same?

A: Some configuration parameters have limits of what they can do, go to the documentation about configuration to check if the value of the configured parameter is out off limit.

Q: When I mount the MoLiTe it performs its standard mounting routine but after four seconds the indicator light doesn't go on for one second but blinks 6 times.

A: blinking 6 times can mean:

1. MoLiTe is not included
2. MoLiTe is not associated
3. MoLiTe can't reached his destination

If all three options are corrected, MoLiTe is will operate correctly and can be mounted again.

Q: When I exclude the MoLiTe the configuration times (idle and switch off) are reset back to default.

A: That is correct when the MoLiTe is excluded all configurations including wake up timings are reset back to default. You will need to configure the device again after included into the controller.

By forcing the tamper switch a wake up message (broadcast) will be send to easily change the configuration.