

**KNX RFID Card Reader
MTN6903-60xx**

Application description 7521/1.0



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1 Product and functional overview

The **KNX RFID Card Reader (Art. no. MTN6903-60xx)** is an EIB/KNX wall mounting device suitable for use as an access control application.

This device can be used in any kind of building (for instance hotels, hospitals, offices, car parks) where an access control application is required.

The device is equipped with two binary inputs (potential free contacts) that can be used, for instance, to control whether the door lock has been opened or closed or to monitor other signals coming from external switches / contacts (i.e. windows, bathroom emergency alarms,).

The Card Reader is also equipped with two output relays which can be used for several purposes, for instance when used in a hotel application it can open the door or turn on the lighting inside the room.

The Card Reader has four LEDs on its front which represent four icons to display the following states (in the case of Hotel management):

- Access Allowed / Not Allowed
- SOS request
- Service Call (such as “clean room”)
- Client status (“Busy room” or “Do not Disturb”)

The LEDs and icons can be configured in association with other alarms or events (see LEDs signalling in the included “Application Notes”).

The Card Reader can read cards or keys at a maximum distance of 30mm from its front side.

The access control follows a sequence where the “Build Number” has firstly been confirmed, then the expiration data, then the password ID for client / guest / service identification, then the enabled days of week and hours range. When the swiped card meets these stipulations the door is opened, the courtesy light is switched on inside and a specific 1 bit object associated to the identified class of user is sent. At the same time the Card Reader sends the access response to the bus in order to be detected and stored by a visualization or management software..

The Card Reader can identify up to four types or classes of users through the reading of four different ranges of passwords written in the cards created with the “Card Writer”.

This Card Reader also contains an alarm function. The Card Reader does this by sending an “Alarm” object (1bit) to an alarm, for instance, centralized visualization software (e.g. “eAccess” or “eHotel”) that a power failure has occurred and that power had been recovered. This information can be useful as it allows visualization and monitoring software to update configuration data to the readers and the card holders.

The physical address, group address and parameters are assigned and programmed with the ETS tool software. In order to commission the device, a PC with ETS2 version V1.3 or higher is required as well as an interface to the bus, e.g. via an RS232 interface or via a USB interface.

This device must be configured and loaded with the following application program:
7521 1.0 KNX RFID Card Reader

With this application program the following functions can be parameterized and configured:

Application Program: 7521 1.0 (KNX RFID Card Reader)

- Max number of group addresses: 35
- Max number of group address associations: 32

General Configurations	<ul style="list-style-type: none"> • <u>Single or Multiple (max 4) user groups identification</u> • <u>Grant date and grant days control enable</u> • <u>Power failure and recovery alarm enable</u>
Input 1 (and 2) Configuration	<ul style="list-style-type: none"> • <u>Switching states ON or OFF can be set depending on input pulse edge evaluation (rising or falling edge).</u> • <u>Cyclical sending option at adjustable intervals</u>
Output 1 Configuration	<ul style="list-style-type: none"> • <u>“General” or “Door Opener” function selection</u> • <u>Normally open or closed contact setting</u> • <u>Time switching (e.g.: “Door lock timing release”)</u>
Output 2 Configuration	<ul style="list-style-type: none"> • <u>“General” or “Lighting” function selection</u> • <u>Normally open or close contact setting</u> • <u>Time switching (e.g.: “Lighting timeout”)</u>

Note: The default settings for the options are underlined (e.g. Values: no/yes)

2 Parameters

2.1 Parameter window “General Configurations”

Device: x.x.x Access Control RFID Card reader

Output 1 configuration	Access sending mode	Multiple access ▼
Output 2 configuration	Grant Date Control	ON ▼
Input 1 configuration	Grant Days Control	OFF ▼
Input 2 configuration	Send alarm	ON ▼
General configuration		

- **Access Sending Mode**

Values: Single Access
Multiple Access

Value “*Single Access*”: enables the 1 bit object (“Valid Access”) that is sent to the bus in case a valid access has been identified by the reader. With this option only one single group of users are managed in the range of permitted passwords.

Value “*Multiple Access*”: enables four 1 bit objects (“Access 1”, ..., “Access 4”) corresponding to the reading and permitted entrance of users whose password is within one of four pre-defined range of passwords.

Once a password is identified as belonging to one of these four classes the object “Access X” is sent to the bus.

This feature allows the identification of users within these 4 classes (e.g. guests, staff, maintenance service, emergency services).

- **Grant Date Control**

Values: OFF
ON

Value “ON”: enables expiration date control during transponder card or key reading.

Value “OFF”: disables expiration date control

- **Grant Days Control**

Values: **OFF**
ON

Value “*OFF*”: the permitted days of week for entrance are not checked.

Value “*ON*”: enables the days of week control.

Note: in both cases the Card Reader always reads and checks the timing hour valid range associated with the card.

- **Send Alarm**

Values: **OFF**
ON

Value “*OFF*”: the device does not send the object “Alarm”

Value “*ON*”: the device sends the object “Alarm” in the case of power failure once the power supply has been recovered.

Note: this feature is useful for visualization software in order to re-send data to the readers after a power failure in order to re-synchronize data and time with the central unit (PC).

2.2 Parameter Window “Output 1 Configuration”

The Output 1 configuration parameters are as follows:

Device: x.x.x Access Control RFID Card reader

Output 1 configuration	Function	General ▼
Output 2 configuration	Contact	Normally Open ▼
Input 1 configuration	Mode	Normal ▼
Input 2 configuration		
General configuration		

- **Function**

Values: **General**
 Door Opener

Value “*General*”: Output 1 is controlled only by the “Output 1” (1 bit) communication object as a normal independent binary output channel.

Value “*Door Opener*”: the Output 1 is switched (ON or OFF depending on option selected in the next parameter “Contact”) if a valid card is read or via the “Door Unlock” (1 bit) communication object.

- **Contact**

Values: **Normally Open**
 Normally Close

Value “*Normally Opened*”:
 Off telegram = contact open
 On telegram = contact closed.

- Value “*Normally Closed*”:
 Off telegram = contact closed
 On telegram = contact open.

- **Mode**

Values: **Normal**
 Timing

Value “*Normal*”: Output 1 will be switched ON by sending an ON command and will be switched OFF by sending an OFF command within the associated object “Output 1”.

The status of the relay contact can be inverted by parameter setting “Contact”: “Normally Close”.

Value “*Timing*”: enables the time switch function (e.g. electrical lock control). See next.

When an On telegram is received via the output object, it is routed directly to the relay. The Off delay that has been assigned starts at the same time. Every further “1” (ON) that is received before the timer has elapsed, resets the delay and restarts it. Once the period has elapsed, a “0” is routed to the output. An Off telegram deletes the Off delay and is immediately routed to the output.

The time for the Off delay is set here. This is calculated from the selected base “Time base” multiplied by the factor “Factor” that is entered here:

$$T_{ON} = \text{TimeBase} \times \text{Factor}$$

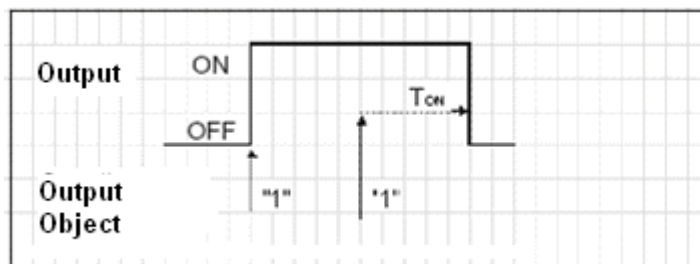
Note: An attempt should always be made to set the required time with the smallest possible base as the base that is selected here also simultaneously specifies the maximum timing error.

- **Time base**

Values: 250 ms, 500ms, **1 s**, 1 min, 1 h

- **Factor**

Values: 0...**10**...255



2.3 Parameter Window “Output 2 Configuration”

Output 2 differs from Output 1 only in the first parameter setting “Function”.

The Output 2 configuration parameters are shown here:

Device: x.x.x Access Control RFID Card reader

Output 1 configuration		
Output 2 configuration	Function	General ▼
Input 1 configuration	Contact	Normally Open ▼
Input 2 configuration	Mode	Timing ▼
General configuration	Time base	1 s ▼
	Factor	2 ▲▼

- **Function**

Values: **General**
 Lighting

Value “*General*”: Output 2 is controlled only by the “Output 2” (1 bit) communication object as a normal independent binary output channel.

Value “*Lighting*”: the Output 2 is switched (ON or OFF depending on option selected in the next parameter “Contact”) if a valid card is read or via the “Lighting” (1 bit) communication object.

All other parameters are as per “Output 1 Configuration” settings, please see functional descriptions in par. 2.2.

Note: please see *Outputs timing diagrams* in “Application Notes”.

2.4 Parameter Window “Input 1 Configuration”

Parameters associated with Input1 channel are the same as those associated with Input 2.

Device: x.x.x Access Control RFID Card reader

Output 1 configuration		Mode	Toggle ON/OFF ▼
Output 2 configuration			
Input 1 configuration		Cyclical sending	OFF ▼
Input 2 configuration			
General configuration			

- **Mode**

Values:

Rising ON
 Rising OFF
 Falling ON
 Falling OFF
 Rising ON / Falling OFF
 Rising OFF / Falling ON
Toggle ON/OFF
 Toggle OFF/ON

With this parameter we can program which status we need to send to the bus (ON/OFF; TOGGLE) when a rising or falling edge is detected in the input signal.

Behaviour:

“Rising On”: A rising edge causes a logic “1” to be transferred to the communication object. A falling edge does not alter the object value.

“Rising Off”: A rising edge causes a logic “0” to be transferred to the communication object. A falling edge does not alter the object value.

“Falling On”: A falling edge causes a logic “1” to be transferred to the communication object. A rising edge does not alter the object value.

“Falling Off”: A falling edge causes a logic “0” to be sent to the communication object. A rising edge does not alter the object value.

“Rising On, Falling Off”: A rising edge causes a logic “1” to be transferred to the communication object. A falling edge causes a logic “0” to be sent.

“Rising Off, Falling On”: A rising edge causes a logic “0” to be transferred to the communication object. A falling edge causes a logic “1” to be sent.

“Toggle ON/OFF”: Each rising edge causes the object value to be inverted. This means that a logic “1” is sent to the communication object after the first rising edge. The next one sends a logic “0” and so on. A falling edge does not alter the object value.

“Toggle OFF/ON”: Each falling edge causes the object value to be inverted. This means that a logic “1” is transferred to the communication object after the first falling edge. The next one sends a logic “0” and so on. A rising edge does not alter the object value.

- **Cyclical Sending**

Values: **OFF**
 ON

This parameter enables the cyclical sending of the current value of Input1 to the bus at a set interval.

- **Cycle Time (Min)**

Values: 1...**10**...255

The cyclical time for sending telegrams repeatedly on the bus with Input1 current value is specified here. The time units are minutes.
This parameter is only visible if previous parameter, Cyclical sending, is set to “ON”.

Note: please see Inputs timing diagrams in “Application Notes”.

3 Communication Objects

The EIB/KNX communication objects provided within the application program “7521 1.0 (KNX RFID Card Reader)” are illustrated here:

Number	Name	Object Func...	Des...	Length	C	R	W	T	U
0	Door Unlock	On/Off		1 bit	C	R	W	T	-
1	Relay 2	On/Off		1 bit	C	R	W	T	-
2	Led 2	On/Off		1 bit	C	R	W	T	-
3	Led 2 Blink	Blink/Off		1 bit	C	R	W	T	-
4	Led 3	On/Off		1 bit	C	R	W	T	-
5	Led 3 Blink	Blink/Off		1 bit	C	R	W	T	-
6	Led 4	On/Off		1 bit	C	R	W	T	-
7	Led 4 Blink	Blink/Off		1 bit	C	R	W	T	-
8	Date	Set Data		3 Byte	C	R	W	T	-
9	Time	Set Time		3 Byte	C	R	W	T	-
10	Build Number	Set Plant ID		2 Byte	C	-	W	T	-
11	Guest Data	Password		10 Byte	C	-	W	T	-
12	Access Code	Access Data		4 Byte	C	-	-	T	-
13	Access 1	Enable		1 bit	C	R	-	T	-
14	Access 2	Enable		1 bit	C	R	-	T	-
15	Access 3	Enable		1 bit	C	R	-	T	-
16	Access 4	Enable		1 bit	C	R	-	T	-
18	Input 1	On/Off/Toggle		1 bit	C	R	-	T	-
19	Input 2	On/Off/Toggle		1 bit	C	R	-	T	-
20	Allarm	On		1 bit	C	R	-	T	-

Nr.	Function	Name	Object Function	Length
0	On/Off	Output 1	DPT_Switch 1.001	1 bit

This object is received from the bus to control Output 1.
 In case the “Door opener” function is enabled this object is named “Door Opening”. Output 1 is also switched after a valid transponder card reading and subsequent entrance acknowledgement (for this usage relay1 should be connected to a door lock). In case the output relay is set as “Normally Open” contact the relay is closed when value “1” is received and it is opened in case of value “0” (vice versa in case of “Normally Close” contact).
 If Timing Mode is enabled when an On telegram is received via the Output object (“Output 1”), it is routed directly to Output 1. The Off delay that has been assigned starts at the same time. Every further “1” (ON) that is received before the timer has elapsed, resets the delay and restarts it. Once the set period has elapsed, a “0” is passed to the output. An Off telegram cancels the Off delay and is immediately routed to the output.

Nr.	Function	Name	Object Function	Length
1	On/Off	Output 2	DPT_Switch 1.001	1bit
<p>This object is received from the bus to control the output Output 2. In case the "Lighting" function is enabled within Output 2 configuration parameters this object is named "Lighting" and causes the Output 2 to be switched ON/OFF. Output 2 is switched ON/OFF in case of a valid Reader card reading and consequent acknowledged entrance (for this usage Output 2 should be connected to the lighting). In case the output relay is set as "Normally Open" contact, the relay is closed when value "1" is received and it is opened in case of value "0" (vice versa in case of "Normally Close" contact). If Timing Mode is enabled when an On telegram is received via the Output object ("Output 1"), it is routed directly to Output 2. The Off delay that has been assigned starts at the same time. Every further "1" (ON) that is received before the timer has elapsed, resets the delay and restarts it. Once the period has elapsed, a "0" is passed to the output. An Off telegram deletes the Off delay and is immediately routed to the output.</p>				
2,4,6	On/Off	LED 2, 3, 4	DPT_Switch 1.001	1bit
<p>The objects LED 2, 3, 4 are used to control, via the bus, the LEDs situated on the front of the housing . In case a switching "ON" signal is received by these objects the LEDs are switched ON continuously until a switching "OFF" signal is received. This command has priority over the object "LED blinking". For an example of LEDs signalling please see "Application Notes" at par. 6.</p>				
3,5,7	Blink/Off	LED 2, 3, 4 blinking	DPT_Switch 1.001	1bit
<p>It receives from the bus an activation or deactivation blinking command for the LEDs 2, 3 and 4. The LEDs blinks with a timing period of 0,5 sec. For an example of LEDs signalling please see "Application Notes" at par. 6.</p>				
8	Set Date	Date	DPT_Date 11.001	3 Byte
<p>The Date object value is used to synchronize the Card Reader with connected visualization software and to verify the access qualification of a valid card. In the device and on the card the date is in dd,mm,yy format where "yy" is a number from 90 to 89 and corresponds to the years from 1990 to 2089. The updating is normally done via the bus at least one time per day and additionally each time that the supervision software (e.g. "eHotel" or "eAccess") receives an "Alarm" signal (i.e. after a power failure).</p>				
9	Set Time	Time	DPT_TimeofDay 10.001	3 Byte
<p>The Time object value is used to verify the access qualification of a valid card and to control the timing hour valid range. The updating is normally done via the bus at least one time per day and each time that the supervision software (e.g. "eHotel" or "eAccess") receives an "Alarm" signal (i.e. after a power failure).</p>				

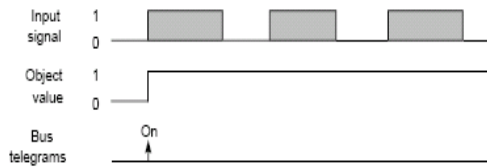
Nr.	Function	Name	Object Function	Length
10	Set Plant ID	Build Number	DPT_Value_2_UCount 7.001	2 Byte
<p>The object "Build Number" is used to identify the installation or the building where the Card Readers are installed.</p> <p>This code avoids any possible risk of using the same card for entrance in two different buildings. It is sent by the building management software during commissioning.</p>				
11	Password	Guest data	NO_DPT	10 Byte
<p>The object "Guest data" is sent by the access control management software to the Card Readers and holders in order to enable entrance and card identification once the transponder card is read.</p> <p>This object (non KNX standard object) contains the user password ID, the card expiration date, the enabled timing entrance ranges, the valid entrance days of week and the expiration data. After the "Build Number" reading and acceptance the Card Reader or Holder controls the password and any other associated information in order to permit or deny entrance to the room.</p> <p>"Guest Data" object is normally sent during configuration of Card Readers and Holders by the access control software (e.g. "eAccess" or "eHotel").</p>				
12	Access Data	Access Code	DPT_Access_Data 15.000	4 Byte
<p>This object is used to send to the bus the result of a Reader card reading.</p> <p>Within this object the password and some reading feedbacks are sent to the centralized access control software (e.g. "eHotel" or "eAccess") to be managed or stored.</p>				
13..16	Enable Access	Access X	DPT_Switch 1.001	1 bit
<p>If "Access sending mode" has been set to "Multiple access" then the four (1 bit) switching objects "Access1"..."Access 4" are visualized.</p> <p>This object is sent only after a successful card reading acknowledgement and entrance has been allowed.</p> <p>Depending on which type or class of user has been detected during a card reading the object "Access X" is sent.</p> <p>At the same time the device also sends the object "Access Code" with the accepted password and other access control information of card reading results.</p> <p>In case "Access sending mode" parameter is set to "Single access" these objects are not enabled but only the unique "Valid Access" object, number 17 below, is used.</p>				
17	Enable Access	Valid Access	DPT_Switch 1.001	1 bit
<p>This object is sent only after a card reading acknowledges a suitable card and entrance has been allowed.</p> <p>If "Access sending mode" has been set to "Single access" then the 1 bit switching object "Valid Access" is used to advise that entrance has been permitted.</p> <p>At the same time the device sends the object "Access Code" with the accepted password and other access control information of card reading results.</p>				

Nr.	Function	Name	Object Function	Length
18, 19	ON/OFF/Toggle	Input X	DPT_Switch 1.001	1 bit
<p>Telegram Values: "0" OFF "1" ON</p> <p>The switching telegrams of inputs 1 or 2 are sent via the associated group addresses to these objects.</p> <p>It is possible to select which signal edge detected at the input channels generate On or Off telegrams via the parameters of the corresponding inputs.</p> <p>With "Toggle" selection the object value is inverted. Should a push button be connected to an input channel, with every push button pressing the status is inverted ON/OFF (or vice versa).</p> <p>In case cyclical sending is enabled the current input value is transmitted to the bus at every timing interval set with a "Cycle time (min)" parameter (this is achieved following monitoring of a physical sensor status by visualization software).</p>				
20	Power alarm	Fail Alarm	DPT_Alarm 1.005	1 bit
<p>In case the parameter "Send alarm" is set to "ON" then this object is shown.</p> <p>This object is sent ("ON") in case of device power failure once the power supply has been recovered.</p> <p>This alarm can be useful to visualization and access control software to re-synchronize data end time to all Card Readers (and Holders) after a power failure.</p>				

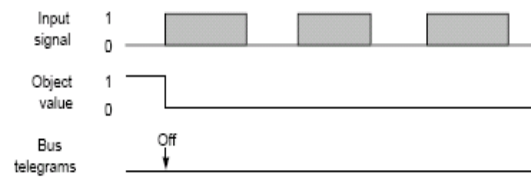
4 Application Notes

Examples of timing diagrams for Inputs

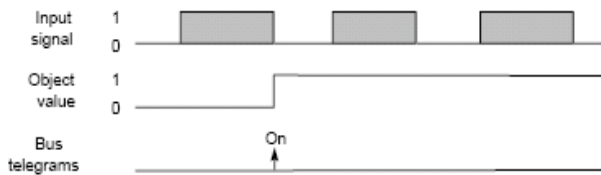
1. Configured with edge evaluation:
"rising On"



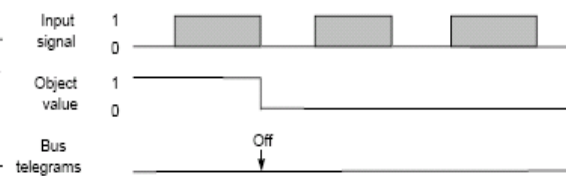
2. Configured with edge evaluation:
"rising Off"



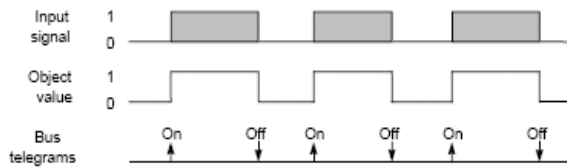
3. Configured with edge evaluation:
"falling On"



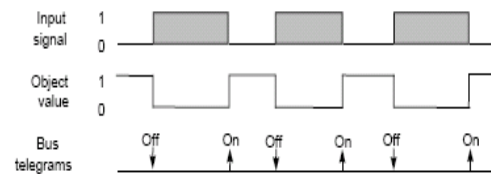
4. Configured with edge evaluation:
"falling Off"



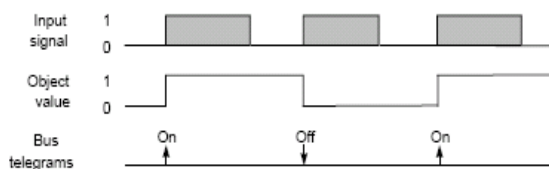
5. Configured with edge evaluation:
"rising On, falling Off"



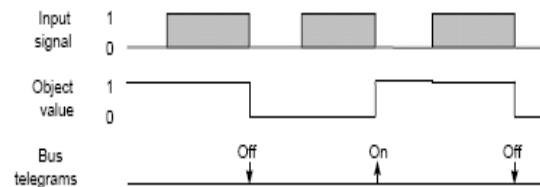
6. Configured with edge evaluation:
"rising Off, falling On"



7. Configured with edge evaluation:
"Toggle On Off"

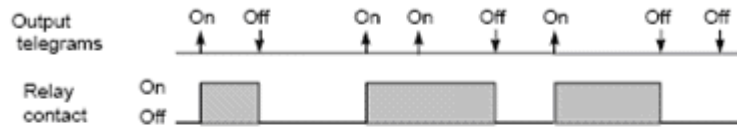


8. Configured with edge evaluation:
"Toggle Off/On"

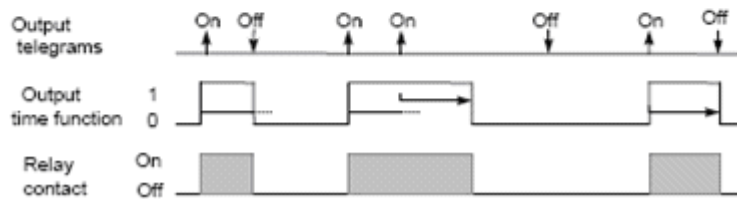


Examples of timing diagrams for Outputs

1. Switching



2. Switching with a time switch function



LEDs signalling: Hotel room management application notes

The four LEDs on the front of the Reader and their corresponding four icons are used to signal and advise transponder card reading feedbacks and some different alarms or user calls coming from the room.

The first, LED1 (red / green light) is used only for transponder card or key reading feedbacks.

These functions are fixed and not configurable by planners or users.

The other 3 LEDs can be configured freely, through group addresses associations, to different kind of alarms or signals coming from inside the room and received from other KNX input components such as push buttons or sensors.

Next, follow a typical Hotel room management usage of such LEDs.

Application Example: LEDs signalling in Hotel Room Management

- LED1 red / green = “access control”. The LED1 is normally OFF. When it is ON it has the following display functions:
 - Fixed Green light for 3 sec: Entrance Allowed (door open command is sent to the bus and / or the Output 1 and 2 are activated)
 - Red blinking for 3 sec.: Reading Error (unreadable card or wrong card reading). Entrance is denied.
 - Fixed Red light for 3 sec.: Entrance Not Allowed (“Build Number” or “Password” or “Grant Date” (if control enabled with parameter) or “Grant Days” (if control enabled with parameter) not valid;
 - Blinking Green Light for 3 sec.: Entrance Not Allowed (access time does not match with timing hours ranges associated with the password);
 - Red and Green LEDs blinking: after an ETS configuration download or after power supply.

The signalling functions, with a fixed or blinking light, associated with the next LEDs (LED2, LED3, LED4) can be configured freely by ETS using the corresponding group objects. In case of Hotel room management, for instance, they can be used along with associated push buttons as follows:

- LED2 red = “SOS alarm” or any other alarm;
- LED3 amber = “Room busy”, “Do not Disturb” or any other alarm;
- LED4 green = “Room Service Call” or any other alarm;