

# Industrial enhanced-safety radio remote controls with operator presence detection

# LD Series



## Typical applications :

### ◆ Industrial lifting

- Travelling cranes, Gantry cranes
- Monorails, Hoists, Jib cranes

### ◆ Industrial equipment

- Handling systems
- Ovens



## 1- Description

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### ➡ A radio remote control provides numerous advantages :

- Large freedom of movement
- Easy to use
- Precise, quality manoeuvres
- Visibility
- Productivity

### ➡ With the LD radio remote controls, Jay Electronique provides solutions to the broad range of enhanced-safety industrial applications implementing button controls. By its modular design, Jay electronique's LD system integrates a number of features in terms of :

- Number of function buttons
- Type of function buttons
- Position of function buttons
- Number of output relays
- Programming of relay / buttons assignments

### ➡ Special attention has been given to ensure operator comfort through the following features :

- Ergonomic transmitters enabling one-hand control
- Control button accessibility
- Button touch sensitivity
- Identification of controlled functions
- Light-weight compact transmitters
- Transmitter endurance, and fast, easy to replace plug-in battery pack
- Adaptability to all radio configurations of the environment by possibility for changing frequency by a trained operator
- Mechanical protection of function buttons to avoid any unintentional action
- Transmitter handle for belt fastening clip when unit is idle or removable shoulder strap (optional accessories)

### ➡ The receiver is also very easy to install :

- Compact receiver
- Spring-type connection terminals

### ➡ To further enhance safety when using this equipment, technical solutions and innovative options are also proposed :

- "Operator presence" detection system to delimit a movement command zone
- Access is enabled by electronic key to an authorised operator only
- Memorisation of use of remote control by recording number of operations and durations for each movement (option)

### ➡ Easy maintenance :

- Customization entirely stored in electronic key
- Parameter definition software (option)
- Diagnostic aid indicator lights

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### ● Compliance with European directives :

- Machinery Cat.3 safety stop as defined by EN954-1
- Hertzian equipment and telecommunication terminals (low voltage, EM compatibility, radiofrequency spectrum) *ART conformity certificate*

## 2- Product features

### 2.1 Transmitter LDE

The transmitters come in 2 housing models : 6 function buttons **or** 10 function buttons. Each model also contains a «On/Horn» button and an emergency stop palm-switch.

The unit's highly modular design allows for installation, in each location, of 6 different types of function buttons as described below :

- One-step pushbuttons (single speed)
- Two-step pushbuttons (single speed)
- Rotary switch with 2 fixed positions
- Rotary switch with 3 fixed positions
- Rotary switch with 3 positions with auto. return
- Electronic switch with 3 fixed positions

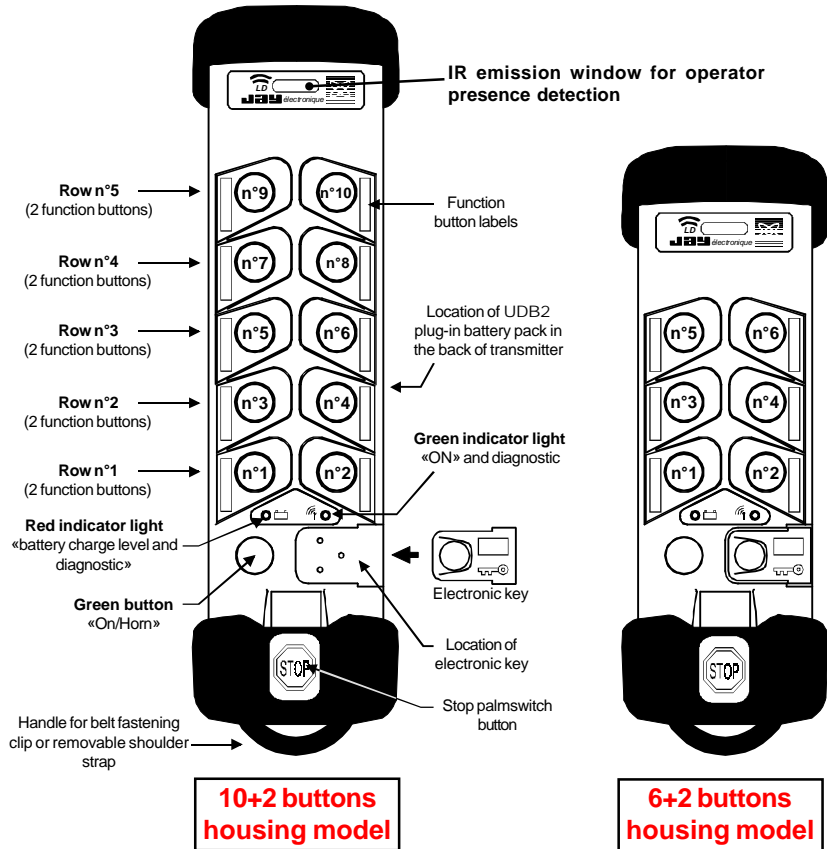
Two parameters can be easily adapted to the environment by a trained operator :

- Operating radio frequency
- Duration of temporization for «dead man» function (Automatic shutdown of remote control in case of prolonged non use)

These operations are performed by procedures implementing buttons n°1, n°2, n°3, the emergency stop palm-switch and the «On/Horn» button, with no need to open the transmitter or receiver.

The change of parameter can be however locked.

The electronic key contains all the parameters of the remote control, it is possible to use an auxiliary transmitter only with the electronic key and a validation procedure.

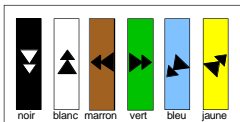


### 2.2 LDE transmitter function button labels

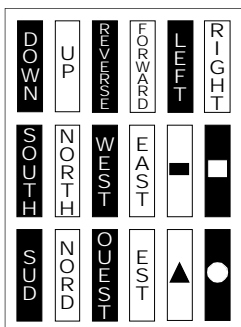
The various button functions are identified by means of adhesive labels placed in the recesses provided in the transmitter unit housing at each button location.

The labels are supplied in the form of sheets with the various labels you will need for your application.

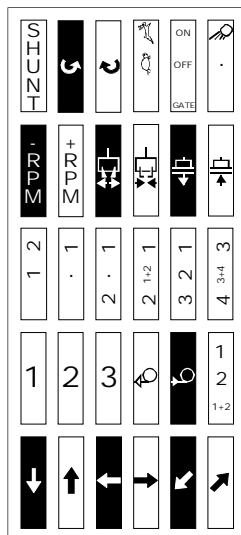
Reference : **UWE202**  
Kit of 6 colored labels, «movements», for double speed pushbuttons (2 steps)



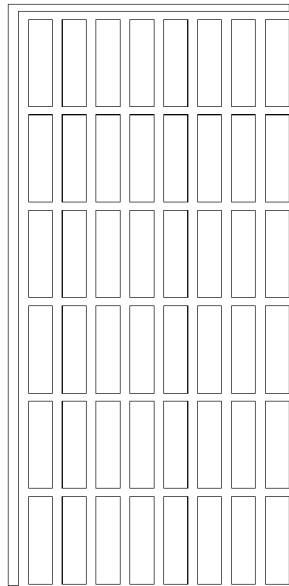
Reference : **UWE203**  
Kit of 18 b/w labels, «special movements», for pushbuttons



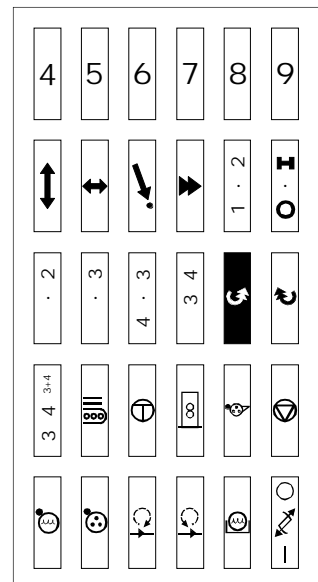
Reference : **UWE204**  
Kit of 30 b/w labels «special functions», for pushbuttons and switches



Reference : **UWE205**  
Kit of 48 white blank labels, «customization» + 48 transparent protecting labels



Reference : **UWE206**  
Kit of 30 b/w labels «special functions» nb.2, for pushbuttons and switches



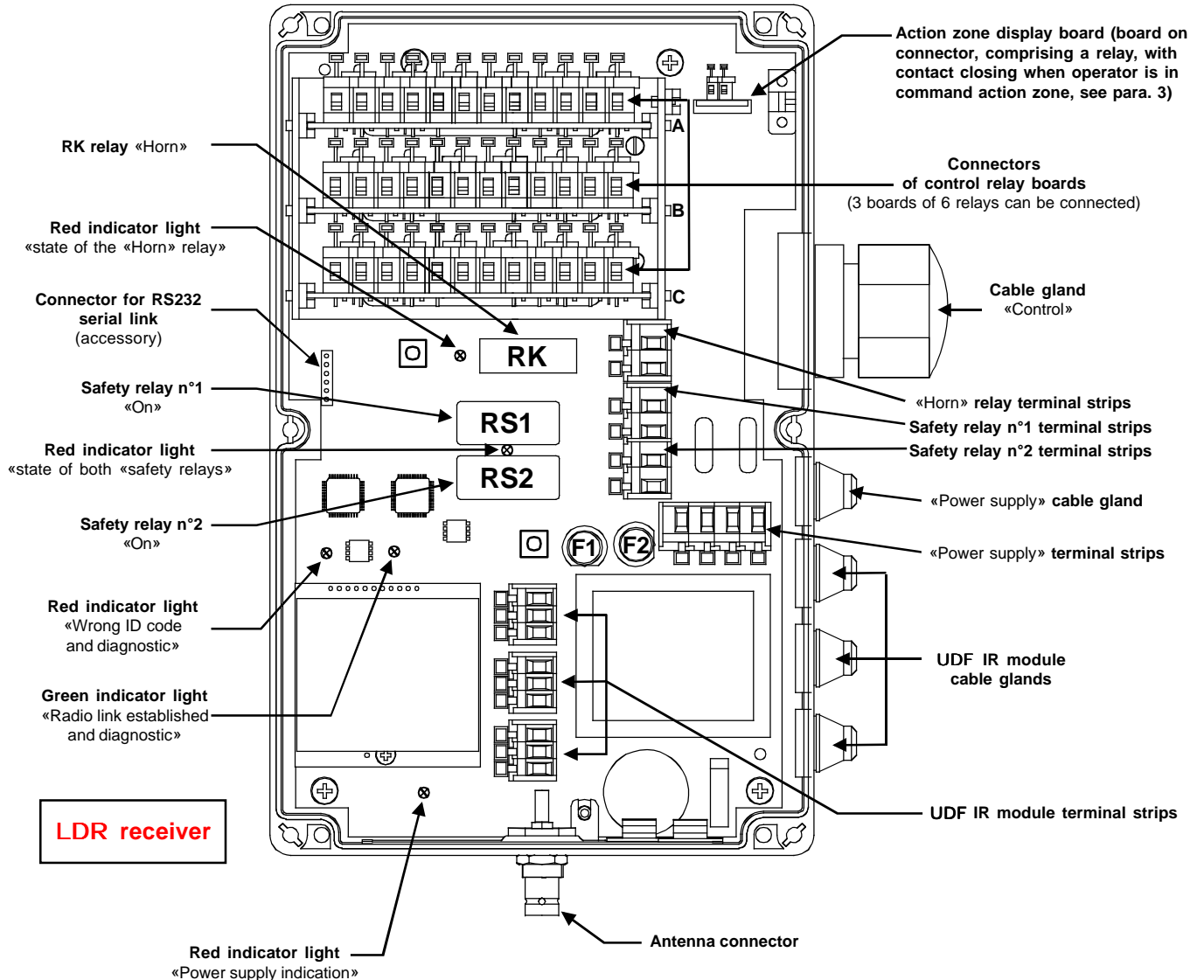
## 2.3 LDR receiver

Receivers are formed by a basic board on which the following components can be connected :

- 1 to 3 boards with 6 control relays
- 1 auxiliary board enabling the operator to display the command action zone
- 1 RS232 serial link board for diagnostic and programming purposes (accessory)

The basic board systematically comprises :

- 1 «Horn» relay  
(active when the transmitter «On/Horn» button is pressed, not auto-maintained)
- 2 safety relays  
(active when the transmitter «On/Horn» button is pressed, auto-maintained until passive or active stop)
- 3 connection terminal strips for UDF infrared modules



## "DialogUD software" option

**DialogUD** provides help to UD and LD system users for configuration, diagnostics and operating status consultation.



**DialogUD** provides the main remote intervention and remote maintenance functions :

- Programming of radio reception frequency.
- Programming of "transmitter button - receiver relay" assignments.
- Programming of control button electrical interlocking.
- Diagnostic function for management of preventive maintenance on equipment (receiver relay transition counter, combined relay activation time and possibility for saving all system information).
- Display of transmitter operation to validate possible configuration changes.
- Display of receiver radio quality rate to diagnose possible zones of disturbances.

**Hardware configuration required :** PC486 DX4 100 MHz min, 32 MØ RAM, 1 serial port.

**Software configuration required :** Windows® 95/98/ME/NT4/2000/XP (registered trademark of Microsoft Corporation - USA).

### 3- Operator presence detection characteristics

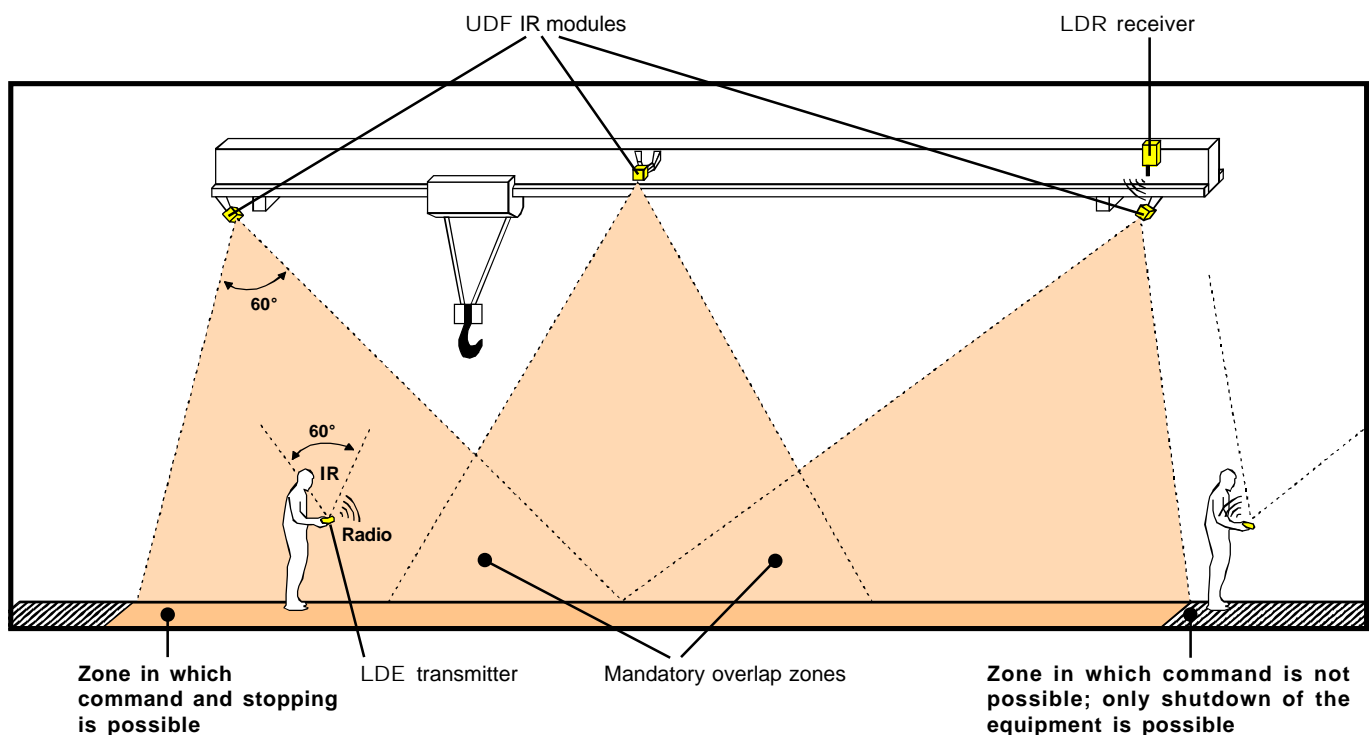
The **LDE** transmitter is equipped with an infrared emission feature ensuring operator presence detection. The **LDR** receiver can be equipped with 3 infrared sensors (**IR** modules: **UDF**) to be positioned in the vicinity of the equipment to be controlled.

Transmitter-receiver communication is ensured by a combined radio and infrared link:

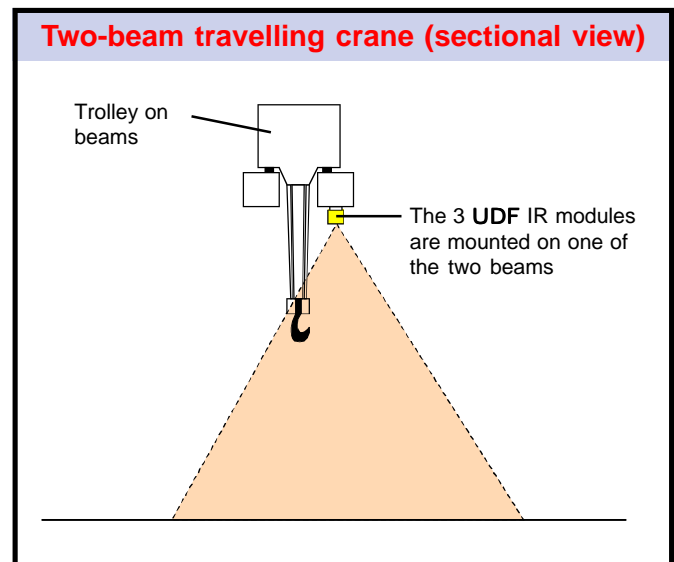
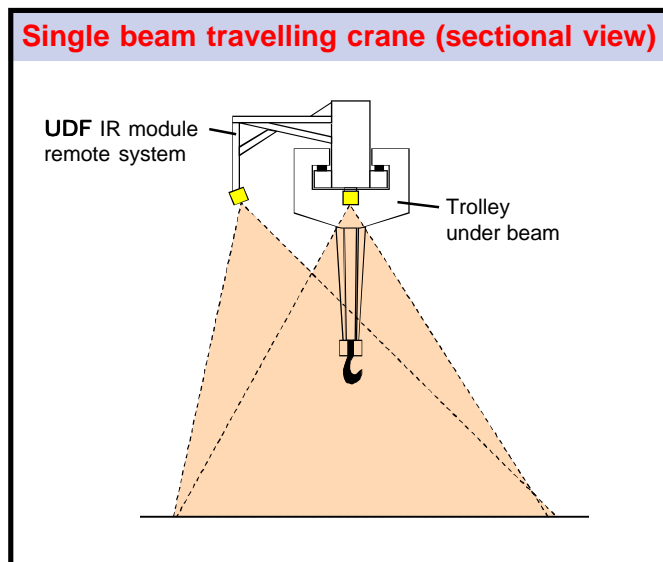
- The equipment movement command is transmitted by the radio link to the **LDR** receiver provided the infrared link between the **LDE** transmitter and one of the **UDF** IR modules is not blanked for more than 4 seconds. Beyond this time period, the movement commands are inhibited. When the operator returns to the infrared field of the **UDF** IR modules, the movement command is again enabled, without the need to restart the **LDE** transmitter.
- The operator always has the possibility of completely shutting down the equipment controlled by pressing the emergency stop palmswitch on the **LDE** transmitter, even if he moves out of the infrared detection field.

A display device to be wired on the receiver informs the operator if he is still in the authorized control field (indicator light, buzzer, etc.).

 **The maximum range ensured between the UDF IR modules and the UDE transmitter is 8 meters.**



#### Example of UDF IR module layouts :



## 4- Safety aspects

The LD remote controls implement numerous safety features, in particular:

### Transmitter / receiver communication safety features:

- A combined radio and infrared link ensures operator presence detection in a perimeter thus defined, as well as the safety shutdown feature from any point in the installation.
- Each transmitter+receiver pair has its own specific identity code.
- Hamming distance (minimum number of bits that differ between 2 messages that are different) of 4.

### Receiver safety features:

- A passive shutdown device shuts down the system if the radio link is jammed.
- Category 3 safety per EN 954-1 is ensured by redundant control of the emergency stop circuit and use of guided contact safety relays.
- Contradictory commands can be interlocked electrically.

### Transmitter safety features:

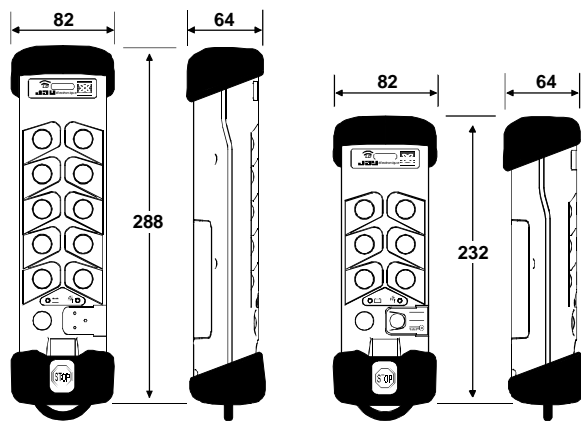
- An active priority general shutdown command is generated when the «stop palmswitch button» is pressed.
- An electronic key limits access to the system to authorised persons only.
- An indicator light indicates an alarm in the event of an insufficiently charged battery.
- A «dead man» function shuts down the transmitter after a pre-programmed time period (1 to 98 mn or 1 to 99s) when no controls have been generated.  
This function can be disabled at any time to meet specific needs.
- Buttons protected mechanically against unintentional actions.

### Functional safety features :

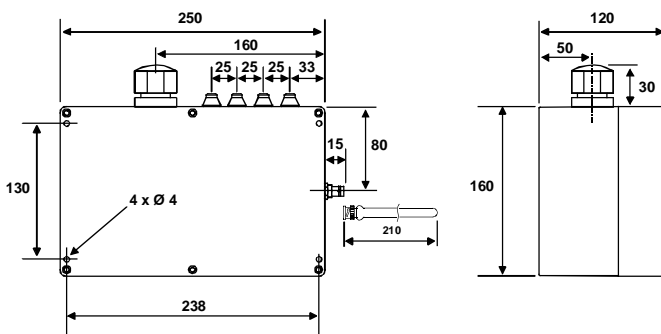
- Start-up sequences are implemented to ensure safe operation by a trained, experienced operator.
- 55 ms response time compatible with the movement speeds of equipment controlled.

## 5- Dimensions

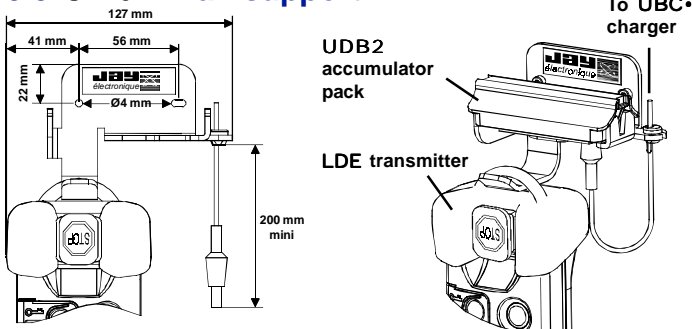
### 5.1 LDE transmitter (10+2 and 6+2 buttons housing models)



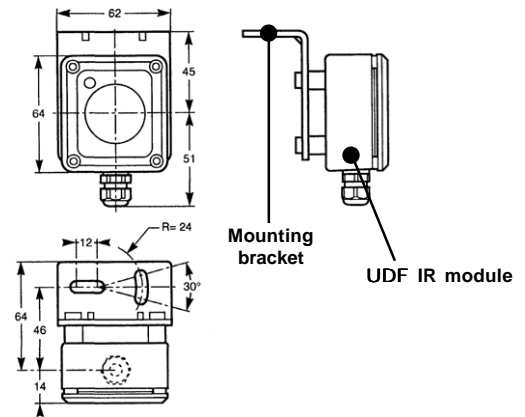
### 5.2 LDR receiver



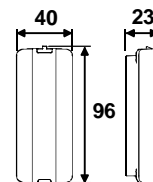
### 5.3 UDC1 wall support



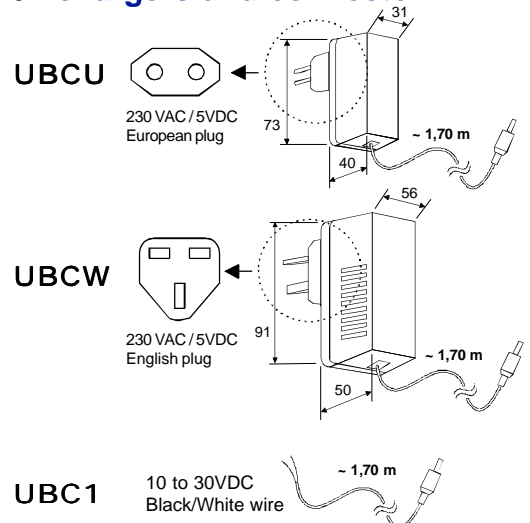
### 5.4 UDF infrared module



### 5.5 UDB2 accumulator pack



### 5.6 UBC• chargers and connector



## 6- Technical characteristics

### 6.1 LDE transmitter

Mechanical and environment withstand characteristics
<b>Housing</b> <ul style="list-style-type: none"> <li>◆ ABS Choc, yellow</li> <li>◆ IP 65</li> <li>◆ Mechanical button protection</li> </ul>
<b>Weight (with battery pack)</b> 6 function buttons : 400 g 10 function buttons : 490 g
<b>Dimensions</b> 6 function buttons : 70x53x220 mm 10 function buttons : 70x53x276 mm
<b>Operating temperature range</b> - 20°C to + 50°C
<b>Storage temperature range (without battery pack)</b> - 30°C to +70°C
<b>Storage temperature range (with battery pack)</b> -30°C to +35°C
<b>Attachment when idle</b> Wall-mounted (by fastening hook) or on belt (by fastening clip)
Electrical and radio characteristics
<b>Power supply</b> Plug-in NiMH battery (battery pack, ref : UDB2)
<b>Autonomy (for 25°C)</b> 16hours / 50 % Transmit time / buttons typical average use
<b>Radio frequency</b> 64 user programmable frequencies UHF 433-434 MHz bands (see frequency list page 7)
<b>Transmission power</b> <10 mW (license not required) fixed antenna
<b>Modulation</b> FM
<b>Average range (LDR with VUB084 antenna)</b> See chapter §3
Functional characteristics
<b>Functions</b> 6 different kinds of function buttons : <ul style="list-style-type: none"> <li>● One-step pushbutton (single speed) "BPSV"</li> <li>● Two-step pushbutton (single speed) "BPDV"</li> <li>● Rotary switch with 2 fixed positions "COM2"</li> <li>● Rotary switch with 3 fixed positions "COM3"</li> <li>● Rotary switch with 3 positions with auto. return "COM3R"</li> <li>● Electronic switch with 3 fixed positions "BPTR"</li> </ul> <ul style="list-style-type: none"> <li>◆ 1 pushbutton "On/Horn"</li> <li>◆ 1 active priority emergency stop palmswitch</li> <li>◆ 1 electronic key</li> </ul>
<b>"Dead man" function</b> Time is user-programmable
<b>Indicator lights</b> <ul style="list-style-type: none"> <li>● 1 red "battery level" and diagnostic indicator light</li> <li>● 1 green diagnostic indicator light</li> </ul>

### 6.2 UDB2 accumulator pack

Mechanical and environment withstand characteristics
<b>Housing</b> <ul style="list-style-type: none"> <li>◆ ABS Choc, yellow, plug-in</li> <li>◆ IP40</li> </ul>
<b>Dimensions</b> ◆ 40x96x23 mm
<b>Storage temperature range</b> -30°C to +35°C
<b>Charging temperature range</b> 0°C to +45°C
<b>Complete charging time</b> 14 hours
<b>Indications</b> <ul style="list-style-type: none"> <li>◆ En charge : 1 red light indicator on battery pack</li> <li>◆ Etat de charge : 1 red light indicator on transmitter</li> </ul>
<b>Charge voltage</b> 10 to 30 VDC

### 6.3 LDR receiver

Mechanical and environment withstand characteristics
<b>Housing</b> <ul style="list-style-type: none"> <li>◆ ABS, yellow</li> <li>◆ IP65</li> </ul>
<b>Weight</b> ◆ 2 kg (approx)
<b>Dimensions</b> ◆ 160x250x120 mm
<b>Operating temperature range</b> - 20°C to + 50°C
<b>Storage temperature range</b> - 30°C to + 70°C
<b>Cable lead-outs</b> <ul style="list-style-type: none"> <li>◆ By cable glands :                              Power supply : 1 rubber PG 9 (1) for cable diameter Ø 5 to 7 mm                              IR modules wiring : 3 rubber PG 9 (1)                              Control outputs : 1 plastic PG 29 for cable diameter Ø 20 to 26 mm</li> </ul>
<b>Connection</b> <ul style="list-style-type: none"> <li>◆ Spring-type terminal strips for 0.08² to 2.5² section wires</li> </ul>
Radio characteristics
Characteristics complying with ETS 300 220
<b>Frequency</b> 64 programmable frequencies in 433-434MHz (see list on page 7)
<b>Antenna</b> Antenna, ref. VUB084, ¼ wave, plug-in, supplied as standard equipment
<b>Sensitivity</b> < -100dBm
Electrical characteristics
<b>Power supply and consumption (2)</b> (With 2 safety relays and 8 function relays (max.) engaged, as well as 3 IR modules connected) <ul style="list-style-type: none"> <li>◆ DC version                             <ul style="list-style-type: none"> <li>● 12VDC, 0 to +25%, 675mA and 188mA when idle</li> <li>● 24VDC, -15% to +20%, 675mA and 188mA when idle</li> </ul> </li> <li>◆ AC n°1 version                             <ul style="list-style-type: none"> <li>● 24VAC, -15% to +10%, 850mA</li> <li>● 48VAC, -15% to +10%, 400mA</li> </ul> </li> <li>◆ AC n°2 version                             <ul style="list-style-type: none"> <li>● 115VAC, -15% to +10%, 180mA</li> <li>● 230VAC, -15% to +10%, 85mA</li> </ul> </li> </ul>
<b>Control</b> 1 + 6, 1+12 or 1+18 relays
<b>Safety</b> 2 relays with linked and guided contacts
<b>Outputs</b> Independent 1 NO relay <ul style="list-style-type: none"> <li>● Category DC13 0,5A / 24VDC , AC15 2A / 230VAC</li> <li>● Max. breaking capacity 2000VA</li> <li>● Max. current 8A (control relays), 6A (safety relays)</li> <li>● Min. current 10 mA (12 Vmin.)</li> <li>● Max. voltage 250VAC</li> <li>● Service life with 230VAC, 70VA, cosphi=0,75 : 3x10<sup>6</sup> cycles</li> </ul>
<b>Response time</b> <ul style="list-style-type: none"> <li>● On start-up : 0,5s max.</li> <li>● On control : 55 ms max.</li> </ul>
<b>Active shutdown time</b> 145 ms max.
<b>Passive shutdown time</b> 1,1 s max.
<b>Indicator lights</b> <ul style="list-style-type: none"> <li>● 1 red "power on" indicator light</li> <li>● 1 red indicator light + 1 green diagnostic indicator light</li> <li>● 1 red status indicator light per relay</li> </ul>
<b>Protections</b> <ul style="list-style-type: none"> <li>◆ Power supply :                             <ul style="list-style-type: none"> <li>● Against polarity inversions for DC versions</li> <li>● Against overcurrents by fuse</li> </ul> </li> </ul>

(1)= The rubber cable glands can be replaced by plastic cable glands (type PG 9) mounted in their place (this accessory is available under ref. UDWR11).

(2)= The number of function relays simultaneously controlled is limited to 10 relays with 1 IR module connected, or to 9 relays with 2 IR modules connected, or to 8 relays with 3 IR modules connected.

# 7- Radio frequencies

433 - 434 MHz bands, with adjacent intervals of 0,025 MHz

Radio channel	Frequency MHz
01	433.100
02	433.125
03	433.150
04	433.175
05	433.200
06	433.225
07	433.250
08	433.275
09	433.300
10	433.325
11	433.350
12	433.375
13	433.400
14	433.425
15	433.450
16	433.475

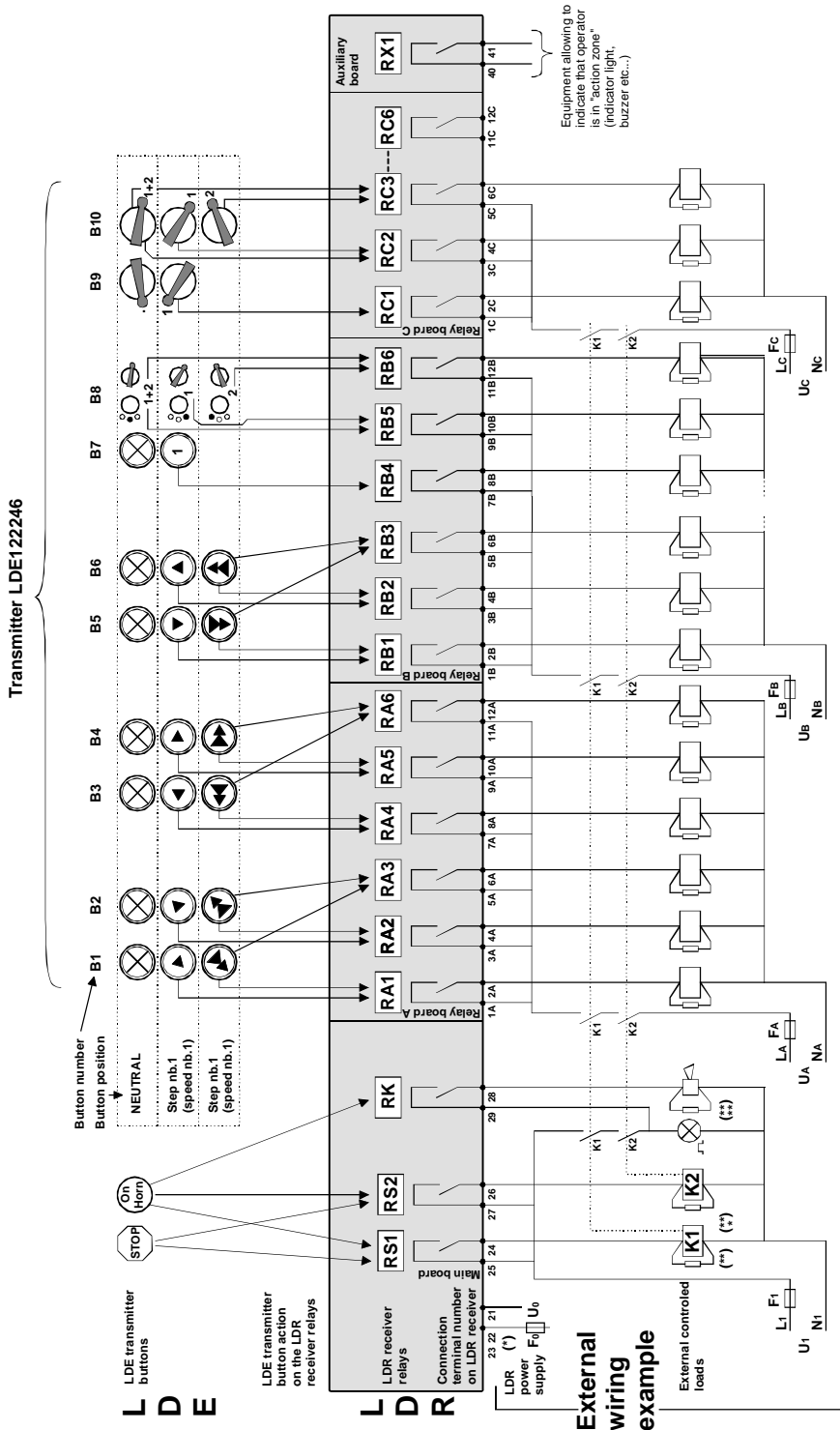
Radio channel	Frequency MHz
17	433.500
18	433.525
19	433.550
20	433.575
21	433.600
22	433.625
23	433.650
24	433.675
25	433.700
26	433.725
27	433.750
28	433.775
29	433.800
30	433.825
31	433.850
32	433.875

Radio channel	Frequency MHz
33	433.900
34	433.925
35	433.950
36	433.975
37	434.000
38	434.025
39	434.050
40	434.075
41	434.100
42	434.125
43	434.150
44	434.175
45	434.200
46	434.225
47	434.250
48	434.275

Radio channel	Frequency MHz
49	434.300
50	434.325
51	434.350
52	434.375
53	434.400
54	434.425
55	434.450
56	434.475
57	434.500
58	434.525
59	434.550
60	434.575
61	434.600
62	434.625
63	434.650
64	434.675

(1)= List of frequencies available for Denmark (2)= List of frequencies available for Singapore

# 8- Example of wiring diagram for LDR receiver



(\*)= The power supply connection depends on the type of receiver and the power supply required. (terminals 23-21 for power supply 12VDC, 24VAC, 115VAC or 22-21 for power supply 24VDC, 48VAC, 230VAC)

(\*\*)= Relay life is increased by the use of surge limiters (ex: RC network for AC, Zener + diodes for DC etc...)

(\*\*)= K1 and K2 must have guided contacts

(\*\*)=Elements wich indicate start of remote controlled machines (ex: horn, rotating / flashing light etc...)

Safety relays RS1 and RS2 are switched "on" by the "On/Horn" transmitter pushbutton, and hold in position until the stop palmswitch is pressed (active shutdown) or until the loss of the radio transmission (passive shutdown).

# 9- Selection guide, references for ordering

## 9.1 LDE transmitter

Diagram illustrating the LDE transmitter configuration. The transmitter is represented by a grid of buttons labeled L, D, E, 1, followed by four empty boxes, and a radio channel field. Callouts explain the button types and configurations:

- Type of function buttons(1) on **first row** (starting from bottom of transmitter)
- Type of function buttons(1) on **second row**
- Type of function buttons(1) on **third row**
- Radio channel (see page nb.7)
- 10+2 buttons housing model** : Type of function buttons(1) on **fourth** and **fifth** row
- 6+2 buttons housing model** : write 0 (zero)
- Configuration type : 1 = standard, x = (equipment definition covered by a customization data sheet)

**(1)= Types of function buttons per row :**

1 = BPSV, BPSV		8 = BPSV, COM3R	
2 = BPDV, BPDV		9 = COM2, COM3R	
3 = BPSV, COM2		A = COM3, COM3R	
4 = BPSV, COM3		B = COM3R, COM3R	
5 = COM2, COM2		C = Cover, Cover	
6 = COM2, COM3		D = BPSV, BPTR	
7 = COM3, COM3		E = COM2, BPTR	

Contact us concerning programming restrictions due to the use of switches on row 1 and row 2.

## 9.2 LDR receiver

Diagram illustrating the LDR receiver configuration. The receiver is represented by a grid of buttons labeled L, D, R, 1, followed by three empty boxes, and a programming field. Callouts explain the button types and configurations:

- Number of function outputs : A = 6 function relays (1 relay board), B = 12 function relays (2 relay boards), C = 18 function relays (3 relay boards)
- (LDR receiver mainboard comprises systematically : 2 safety relays + 1 "On/Hom" relay)
- Programming of button - relay correspondence : Number of relays controlled by BPDV (double speed pushbutton) 1 = 3 relays or no BPDV, 2 = 4 relays, x = special (equipment definition covered by a customization data sheet)
- Power supply : 4 = 12 - 24 VDC, A = 24 - 48 VAC, B = 115 - 230 VAC
- Programming of transmitter BPSV and BPDV button interlocking : 0 = no interlocking or COM on each row, 1 = interlocking B1-B2, B3-B4, B5-B6 with output relays set to OFF, 2 = interlocking B1-B2, B3-B4, B5-B6 with priority on left button, 3 = interlocking B1-B2, B3-B4, B5-B6 with priority on right button, x = special (equipment definition covered by a customization data sheet)
- Programming button - relay correspondence : Type of control for COM3, COM3R and BPTR (switches with 3 positions) 1 = Type : 1/1+2/2 or no COM3/BPTR, 2 = Type : 1/OFF/2, 3 = Type : 1/2/1+2, x = special (customization data sheet)

## 9.3 UDF infrared modules

The number of modules to be controlled depends on the length of the equipment to be controlled (see chapter 3); up to 3 UDF modules can be connected to the LDR receiver.

Kit version : 1 = 1 IR module (10m cable included), 2 = kit with 2 IR modules (10m cable included)

### Example :

**LDE113600-011, LDR1BB00-112, UDF1, UDF2, UBCU**

- **LDE transmitter** (presence detection system), 6+2 buttons housing model, with electronic key, button configuration : 1st row BPSV-BPSV, 2nd row BPSV-COM2, 3rd row COM2-COM3, label kit ref:UWE204 is delivered with the transmitter and pre-programmed radio channel is 01 (433.1 MHz).
- **LDR receiver**, 3+12 relays, power supplied 115-230VAC, without programmed interlocking, without BPDV on transmitter, COM3 of the transmitter are : 1/OFF/2.
- 3 **UDF** infrared modules
- 1 **UBCU** 230VAC/12VDC charger - european plug (for battery pack charging)

### ◆ Accessories for LDE transmitter :

Reference	Description
UBCU	Charger 230VAC(european plug)/12VDC (for battery pack charging)
UBCW	Charger 230VAC(english plug)/12VDC (for battery pack charging)
UBC1	Battery connector (vehicle plug) (for battery pack charging)
UBD2	Plug-in battery pack <sup>(5)</sup>
UDC1	Wall support for stowing and battery pack charging when idle
UDWE22 X	Programmed electronic key (parameters to be supplied) <sup>(5)</sup>
UDP1	Belt fastening clip <sup>(5)</sup>
UWE102	Removable shoulder strap
UWE202	Kit of 6 colored labels "movements" for double speed pushbuttons (2 steps) <sup>(6)</sup>
UWE203	Kit of 18 black/white labels "special movements" for pushbuttons
UWE204	Kit of 30 black/white labels "special functions" for pushbuttons and switches <sup>(6)</sup>
UWE205	Kit of 48 white blank labels for customized marking
UWE206	Kit of 30 black/white labels "special functions" nb.2 for pushbuttons and switches

(5)= 1 accessory supplied with product

(6)= Label kit supplied with transmitter according to configuration of buttons

### ◆ Accessories for LDR receiver :

Reference	Description
UDWR10	10m cable extension for UDF infrared modules
VUB084	433MHz 1/4 wave straight antenna 433 MHz <sup>(5)</sup>
VUB086	433MHz 1/2 wave straight antenna
VUB105	2m extension for antenna + non insulated bracket
VUB125	5m extension for antenna + non insulated bracket
VUB150	1/4 wave antenna for vehicle with 5m cable
UWE001	2 ways directional arrows
UWE002	4 ways directional arrows <sup>(5)</sup>
UDWR11	Plastic cable glands for receiver (1 PG29 + 4 PG9)
UDWR12	Common wiring accessory <sup>(5)</sup>
UDWR13	24-pin plug-in connector + 2m cable
UDWR14	16-pin plug-in connector + 2m cable
UDWR32	Serial link board
UDWR36	"DialogUD" software (CD-ROM + PC/LDR cable)

The products presented in this document are subject to change. Product descriptions and characteristics are not contractually binding.

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