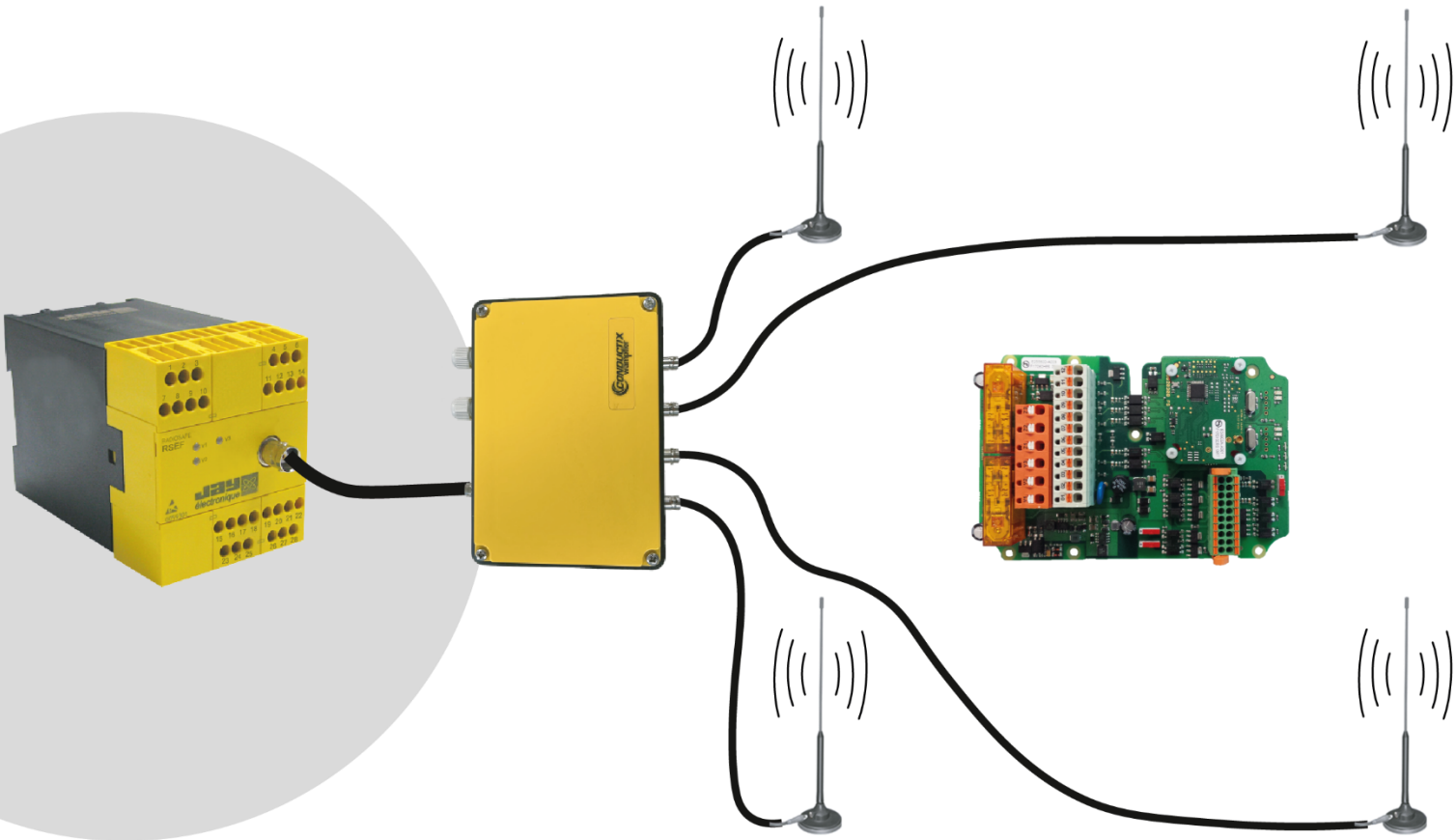
RS Series

Safety stop for mobile equipment fleets



Installation and User Technical Manual

TRANSLATED FROM ORIGINAL VERSION

EN

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1. Introduction

1.1. Safety rules and general precautions

The RadioSafe system are control and safety components ensuring an emergency stop function according to the terms defined in the European Machinery Directive 2006/42/EC. The following safety rules must be applied to install and use the RadioSafe system.

- To ensure safety when using the system, the instructions given in this manual must be strictly respected.
- RadioSafe system operators must be appropriately trained and authorised to use the product.
- RadioSafe system operators must always have an uninterrupted visibility when performing manoeuvres.
- Where several systems are implemented on a single site, different radio frequencies must be used. These should be spaced by at least 2 radio channels (for example, channels 5, 7, 9, …) or by 5 radio channels when several systems are operating within a 10 meters radius. Please contact us for dense installations.
- It is not advisable to install the RSEF safety transmitter and RSRD safety receiver in the same cabinet to prevent disruption of the receiver. If you need to install these two elements in the vicinity, please contact us.
- In the event of a malfunction, the installation should be immediately shut down by pressing any emergency stop pushbutton and particularly the one connected to the RSEF safety transmitter.
- If an **enabling handle** is used for the application, this device must comply with the requirements of IEC 60947-5-1 / EN 60947-5-1, IEC 60947-5-8 / EN 60947-5-8 and IEC 60204-1 / EN 60204-1 standards.
- All **Emergency Stop buttons** used for the application must comply with the requirements of IEC 60947-5-5 / EN 60947-5-5 and IEC 60204-1 / EN 60204-1 standards.
- **If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**

The products described in this manual are designed to meet the requirements of Machinery Directive 2006/42/EC based on the application of the following standards:

- EN ISO 13849-1:2015 for performance level PL e (Category 4),
- And EN IEC 62061:2021 for SIL 3.

1.2. Components identification

The RadioSafe “secure stop for mobile equipment fleets” solution can be ordered in separate components:

References	Elements	Visuals	Notes
RSEF41-1 & RSEF4P-1[4] (434 MHz) RSEF91-1 & RSEF9P-1[5] (915 MHz)[1] RSEFJ0-1 (920 MHz)[2]	**RSEF transmitter**		Supplied with: - 1x SIM card (inserted inside) - 1x VUB060 (BNC elbow) - 1x VUA103AM antenna [3] - 1x USB keycard
RSRD4000-1 (434 MHz) RSRD9000-1 (915 MHz) RSRDJ000-1 (920 MHz)	**RSRD receiver**		
RSW39	Serial 232 to USB cable		*One piece can be sufficient for all RSRDevice manual maintenance operations*
VUB090 (for RSEF) VUB095 (for Jump)	**RF switch**		Supplied with: - 1x 2-m synchro 3-wire cable welded internally
RSswitch	**RF switch 2-4 outputs**		*Must be wire to the JUMP/RSEF using a 3-strands cable (not provided)*
VUB202	2-meter coaxial cable		*Typically used for:* - *RSEF/RFswitch connection* - *Jump/RFswitch connection*
JUT0A110 (433 MHz) JUT9A110 (915 MHz) JUTJA110 (920 MHz)	**Jump repeater**		Supplied with: - 1x VUA001A antenna [4] *Also available with an internal battery instead of a 9-28VDC supply (replace letter A by B)* *Also available with internal radio module, instead of external BNC antenna connector (replace 110 by 120)*

Any RadioSafe “secure stop for mobile equipment fleets” solution can be ordered with grouped references specific to any application to simplify orders and to reduce the number of references to be ordered. Please refer to section 6 for specific antenna choices.

[1] Certified according to the FCC standard
[2] Certified according to ARIB STD-T108 standard
[3] VUA103BM in 869, 915 MHz and 920 MHz
[4] RSEF4P-1 to compensate the insertion loss in the RF cables and/or RSswitch
[5] RSEP9P-1 to compensate the insertion loss in the RF cables and/or RSswitch

1.3. Product operating principle

The RadioSafe system is used to transmit safety and logic signals from one point of an installation to another one.

The RSEF transmitter is designed to trigger the following events onto an unlimited number of RSRD receivers:

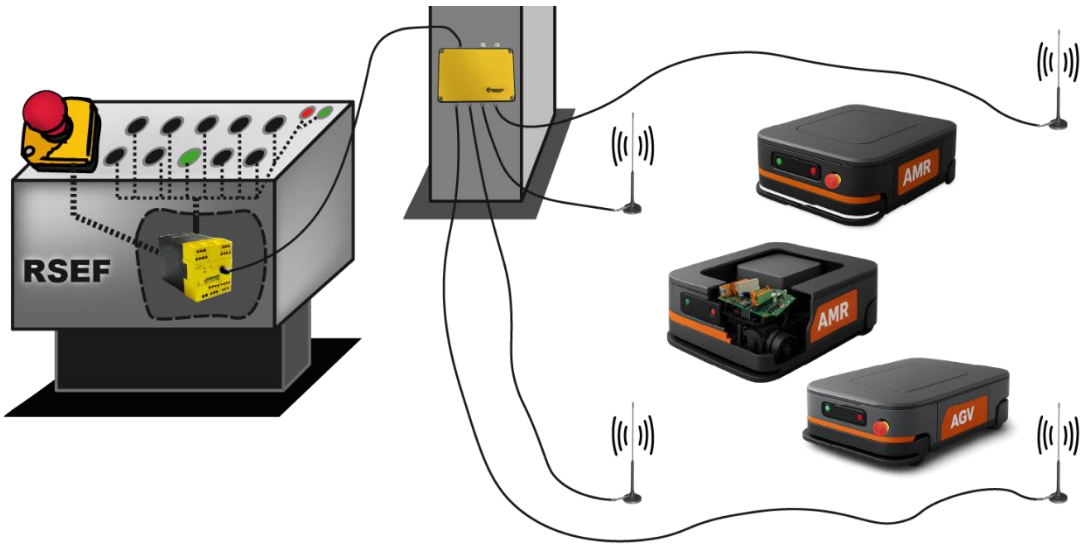
- An emergency stop in the event of a problem occurring in the installation,
- Up to 10 commands (which can be combined).

The RSRD receiver is integrated in the control component of a machine. It enables (or forbids) operation of the machine and transmits the possible commands assigned to the buttons connected to the RSEF transmitter.

The RSRD receiver stops the machine operation when any of the following conditions occurs:

- **Case 1: A safety input connected to the RSEF transmitter (for example: contact on a gate or an emergency stop) is deactivated.**
  - ➢ The stop request leads to a safety interlock.
- **Case 2: The emergency stop device wired on the** RSRD **receiver is triggered.**
  - ➢ The stop request leads to a safety interlock.
- **Case 3: During operation, the radio link is interrupted.**
  When the system is in operation, the RSEF transmitter has a continuous radio link with the RSRD receiver. If this radio link is interrupted in a delay exceeded the passive stop time, the receiver automatically triggers the stop of the installation.
  - ➢ A safety interlock occurs prior to loss of control of stopping function.
- **Case 4: A malfunction is detected (see section 7 for troubleshooting).**

Schematic diagram:



Block diagram showing a fixed control panel equipped with a RSEF transmitter and a RSswitch communicating with several mobile robots equipped with RSRD receivers

Antennas for RSRD receivers must be chosen in accordance with the mechanical design of each piece of equipment. Emergency stop pushbuttons must comply with the requirements of IEC 60947-5-5 / EN 60947-5-5 and IEC 60204-1 / EN 60204-1 standards.

2. Installation preliminary steps

This section details the recommended preliminary steps to follow to become accustomed to the equipment. It details the products factory settings, the terminals identification of the products and test wiring and procedures to perform (if necessary).

2.1. Default factory settings

RSEF transmitter

Radio power level	**Fixed**	(According to RSEF model number)
Radio channel number	**64**	(DIP switches N°1 to 6: UP ↑)
Self-check of inputs upon auxiliary supply activation	**NO**	(DIP switches N°7: DOWN ↓)
Transmitter restart mode	**Automatic**	(DIP switch N°8: UP ↑)

RSRD receiver

Safety delay	**0s**	(Configurable from 0s to 10s)
Passive stop time	**1s**	(Configurable from 0.3s to 2s)
➢ To modify DIP switches and configurable settings, please refer to Section 3.		

IMPORTANT: According to Machinery Directive, Clause §4.1.1 (EN ISO 13850:2015), all time delays must be determined based on the risk assessment of the machine. Please also refer to EN 60204-1:2018, Clause §9.2.3.4.2.

SIM card (inserted inside RSEF)

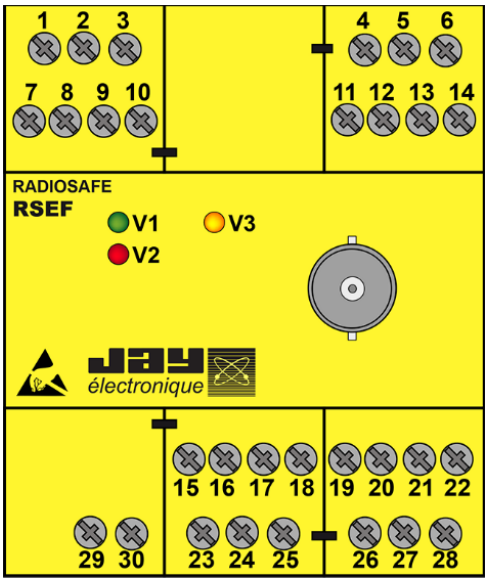
Identity Code	**Fixed**	(Unique hexadecimal code issued by JAY)
SIM serial number	**Fixed**	(Unique number issued by JAY)
Applicable radio band	**Fixed**	(434MHz, 915MHz or 920MHz band)
DIP switches status	**Updated according to latest validation status**	
➢ In the event of a transmitter failure, the SIM card can be used in a backup transmitter. A fault status will be triggered if the backup transmitter DIP switches are not compliant with the status registered in the SIM card (until a new validation.		

The RSRD dedicated programming software is available on JAY Electronique website. Its use is protected by a password which is only delivered to a “level 2” skilled person (a person who was trained by JAY Electronique and who is authorized to modify RSRD receiver parameters).

2.2. RSEF safety transmitter: terminal blocks

It is necessary to check that the SIM card is well inserted inside the RSEF transmitter as shown with the red circle below. There is a dedicated slot located behind the transmitter front cover.

Before any installation, it is highly recommended to perform a quick test as described in the following section.



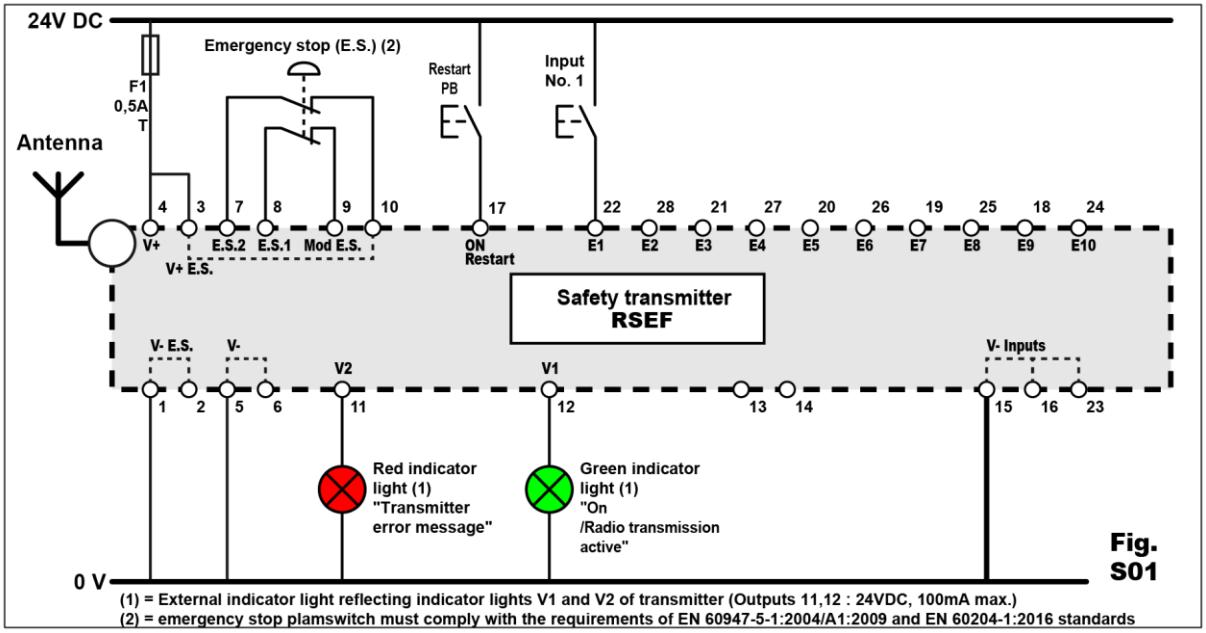
Terminal	Function
1	**V-** E.S.
2	**V-** E.S.
3	**V+** E.S.
4	**V+** RSEF
5	**V-** RSEF
6	**V-** RSEF
7	E.S. contact 1
8	E.S. contact 2
9	E.S. mode
10	**V+** E.S.
11	Ind. light **V2** output
12	Ind. light **V1** output
13	Not used
14	Not used
15	**V-** Inputs
16	**V-** Inputs

Terminal	Function
17	On / Restart button input
18	Input No.9
19	Input No.7
20	Input No.5
21	Input No.3
22	Input No.1
23	**V-** Input
24	Input No.10
25	Input No.8
26	Input No.6
27	Input No.4
28	Input No.2
29	0 V of module VUB090
30	+5 VDC of module VUB090

Ind. light	Function
V1	(GREEN) "On", "Radio transmission", "Diagnostic"
V2	(RED) "Diagnostic"
V3	(ORANGE) "Power supply"

2.3. Transmitter test wiring (independent from any application)

The following diagram shows a test wiring that is intended to test an emergency stop input and a command input:



- **Step 1:** Prepare a stabilized power supply with the following characteristics: 24VDC (± 20 %), 500mA minimum.

- **Step 2:** Wire the transmitter as following:
  - Connect the +24VDC of the stabilized power supply to terminals **3** and **4**.
  - Connect the ground of the power supply to the 3 following terminals: **1**, **5** and **15** (ground ref. of inputs).
  - Connect a NC double contact emergency stop button to terminals **7**, **8**, **9** and **10**.
  - Connect a NO button “Restart” across the +24VDC and terminal No. **17**.
  - Connect a NO button simulating an input across the +24VDC and terminal No. **22** (E1).
  - Possibly, indicator lights giving the same indication as indicator lights **V1** and **V2** of the transmitter may be connected to terminals **11** (V2) and **12** (V1) and 0V.

- **Step 3:** Switch on the auxiliary power supply of the transmitter.

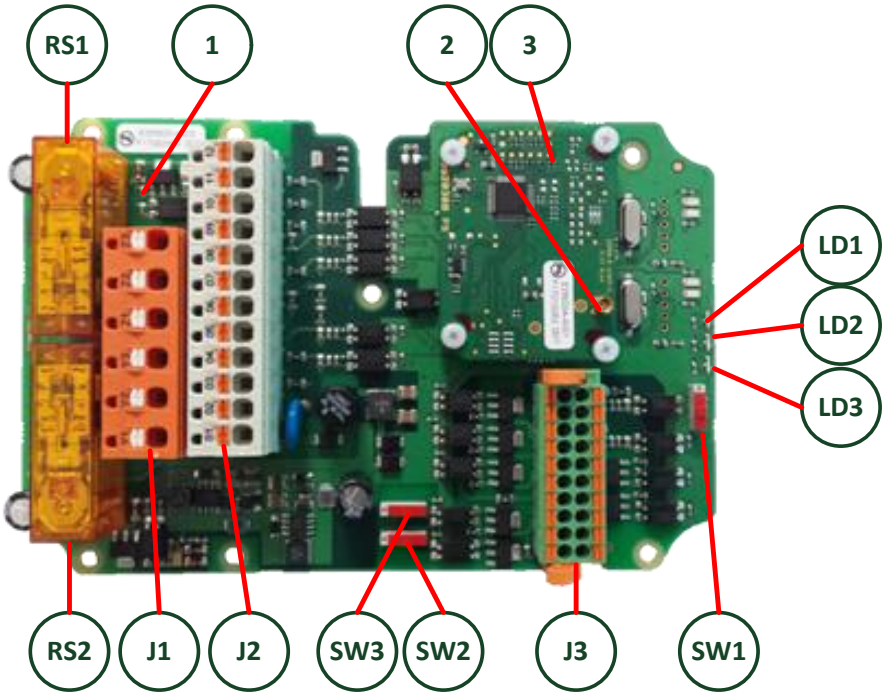
- **Step 4:** Activate the safety input (by unlocking the emergency stop).

- **Step 5:** Press the Restart pushbutton in case of manual restart mode.
  Indicator light **V3** of the transmitter should come on steady state, indicator light **V1** should flash regularly (active radio transmission) and indicator light **V2** should be off; if this indicator light flashes, there is an error: refer to the error message table.

- **Step 6:** Switch off the transmitter power supply.

To wire the RSRD safety receiver, proceed as explained in the following pages.

2.4. RSRD Safety receiver: terminal blocks

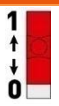


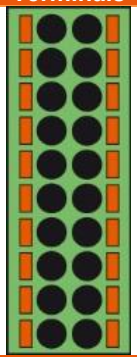
RS1&RS2	Safety relays
1	Red indicator light: status of safety relays **RS1** and **RS2**
2	Antenna BNC / antenna extension connector
3	Radio module
LD1	Yellow indicator light: Transceiver power supply OK
LD2	Red indicator light: status of safety relays **RS1** and **RS2**
LD3	Green indicator light: Radio reception + Diagnostics

J1 Terminal block: Safety outputs	
Terminal	**Function**
Y1	1st safety output (NO contact)
Z3	
Y2	2nd safety output (NO contact)
Z2	
Y3	3rd safety output (NO contact)
Z1	

J2 Terminal block: Safety Inputs and power supply	
Terminal	**Function**
12	Input for Enabling Handle Detection
11	
10	Input 2 for Enabling Handle
09	
08	Input 1 for Enabling Handle
07	
06	Input 2 for emergency stop or safety light curtain
05	
04	Input 1 for emergency stop or safety light curtain
03	
02	**V-** (GND)
01	**V+** 24VDC

SW3/SW2: Output power supply selection	
	**Position "1":** Output power supply connected on receiver RSRD 24VDC and GND (default)
	Position "0": Output power supply connected on external V+ and V-

SW1: Functioning mode	
	**Position "1":** Receiving mode (default)
	Position "0": Programming mode

J3 Terminal block: Communication, Static outputs and Indicators				
Function	**Terminals**			**Function**
RXD RS232*	**1**		**2**	not used / not connected
TXD RS232*	**3**		**4**	Configuration INPUT*
GND*	**5**		**6**	Configuration GND*
Error message (**red** indicator light) **+**	**7**		**8**	Error message (**red** indicator light) **-**
Radio reception status (**orange** indicator light) **+**	**9**		**10**	Radio reception status (**orange** indicator light) **-**
Machine operating status (**green** indic. light) **+**	**11**		**12**	Machine operating status (**green** indic. light) **-**
Input for main contactor monitoring function	**13**		**14**	Input for main contactor monitoring function
Power supply of outputs **V+**	**15**		**16**	Power supply of outputs **V-**
Output **nb.1**	**17**		**18**	Output **nb.2**
Output **nb.3**	**19**		**20**	Output **nb.4**

*(used with a dedicated software)

2.4.1. Assignment of RSEF inputs to RSRD static outputs

The RSEF transmitter inputs are assigned to the following RSRD receiver outputs:

		Assignment of outputs of RSRD receiver (terminal No.)			
		17	18	19	20
Inputs of RSEF transmitter	E1	X			
	E2		X		
	E3			X	
	E4				X

2.4.2. Voltage reference of RSRD static outputs

There are two operating modes for outputs voltage 1-4 which are:

- **The isolated mode:** isolated from the main supply voltage,
- Or **the non-isolated mode:** linked to the main supply voltage.

In both cases, the maximum output current is 100mA per output.

Isolated mode:

- **SW3** and **SW2** must be set in position "**0**".
- A continuous supply voltage must be applied between points 15-16 of J3. This supply voltage must be between 5-30VDC. (input 15: V+ and input 16: V-)
- The insulation voltage should be: > 4400 VRMS.

Non-isolated mode:

- **SW3** and **SW2** must be set in position "**1**".
- Terminal points 15-16 of J3 must be unconnected.
- The outputs power supply is the supply voltage of the RSRD receiver.

2.5. Receiver test wiring (independent from any application)

The following diagram shows a test wiring that is intended to test an emergency stop input and a command output:

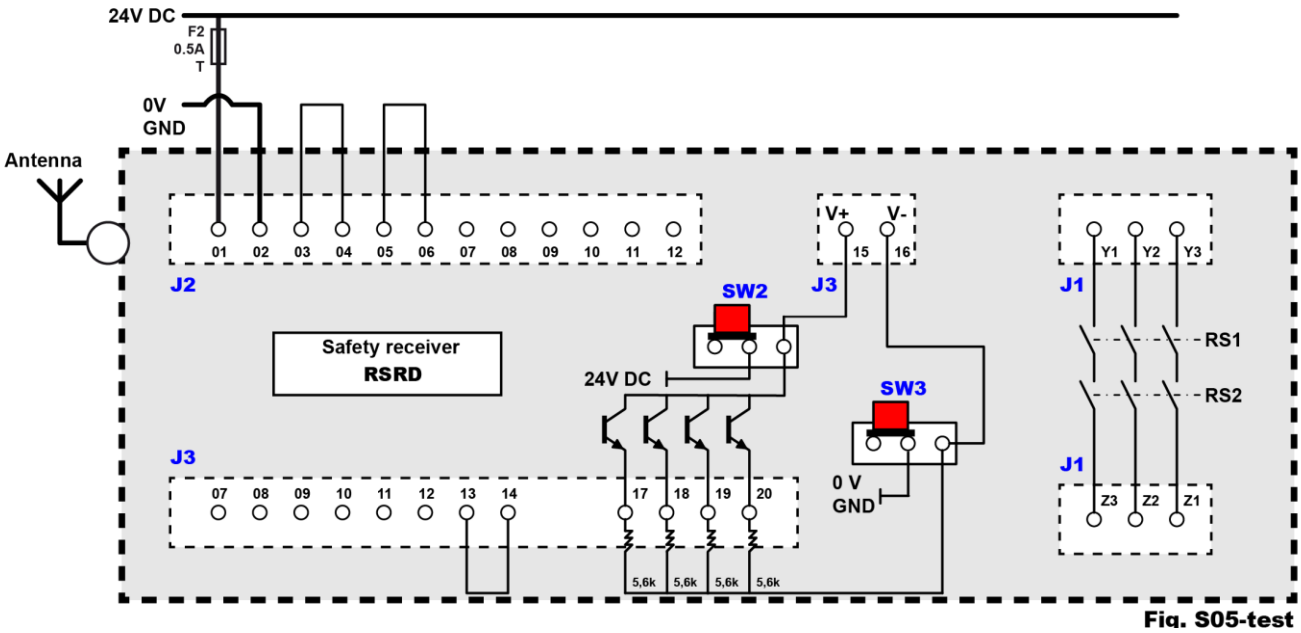


Fig. S05-test

- **Step 1:** Prepare a stabilized power supply with the following characteristics: 24VDC (± 5 %), 500mA minimum.

- **Step 2:** Wire the receiver as following:
  - Shunt the terminal pairs **J2**[03-04], **J2**[05-06] and **J3**[13-14].
  - Connect the +24VDC of the stabilized power supply to terminal **J2**[1]**.**
  - Connect the ground of the power supply to the terminal **J2**[2].

- **Step 3:** Power supply the receiver.
  The yellow indicator light **LD1** on the receiver comes on steady state.

- **Step 4:** Switch off the receiver.
  Perform the system test as detailed in the next section.

2.6. Global system test before installation

- **Step 1:** Switch on the **RSEF** transmitter and the **RSRD** receiver.

  The **RSRD** receiver should be ready to receive the **RSEF** transmitter radio frames:

  - The indicator light **LD1** comes on steady state.
  - The indicator light **V3** on the **RSEF** transmitter comes on steady state.

- **Step 2:** Activate the safety input (by unlocking the emergency stop button) on both devices.
  The **RSEF** transmitter should be ready to transmit:

  - The indicator light **V1** should go off steadily.

- **Step 3:** On the **RSEF** transmitter:
  Press on the restart pushbutton (If the transmitter is in « manual » restart mode).

  - The indicator light **V2** should blink.

  On the **RSRD** receiver:
  The safety relays (**RS1** and **RS2**) should engage.

  - The two indicator lights **LD2** and **LD3** should go off steadily.

- **Step 4:** Press the emergency stop pushbutton connected to the **RSEF** transmitter

  The **RSRD** receiver safety relays should immediately be deactivated.

For any technical assistance, please contact the manufacturer at the following contact address:

JAY Electronique
ZAC la Bâtie, 37 rue Champrond
F38334 SAINT-ISMIER Cedex

Tel: +33 (0)4 76 41 44 00
Website: www.jay-electronique.com
Mail: support.technique.jay@conductix.com

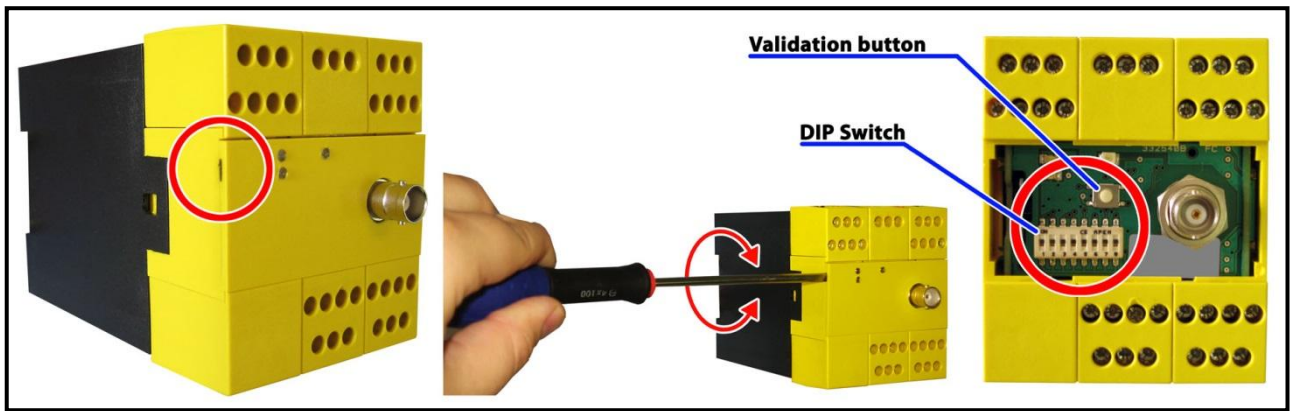
3. Products configuration

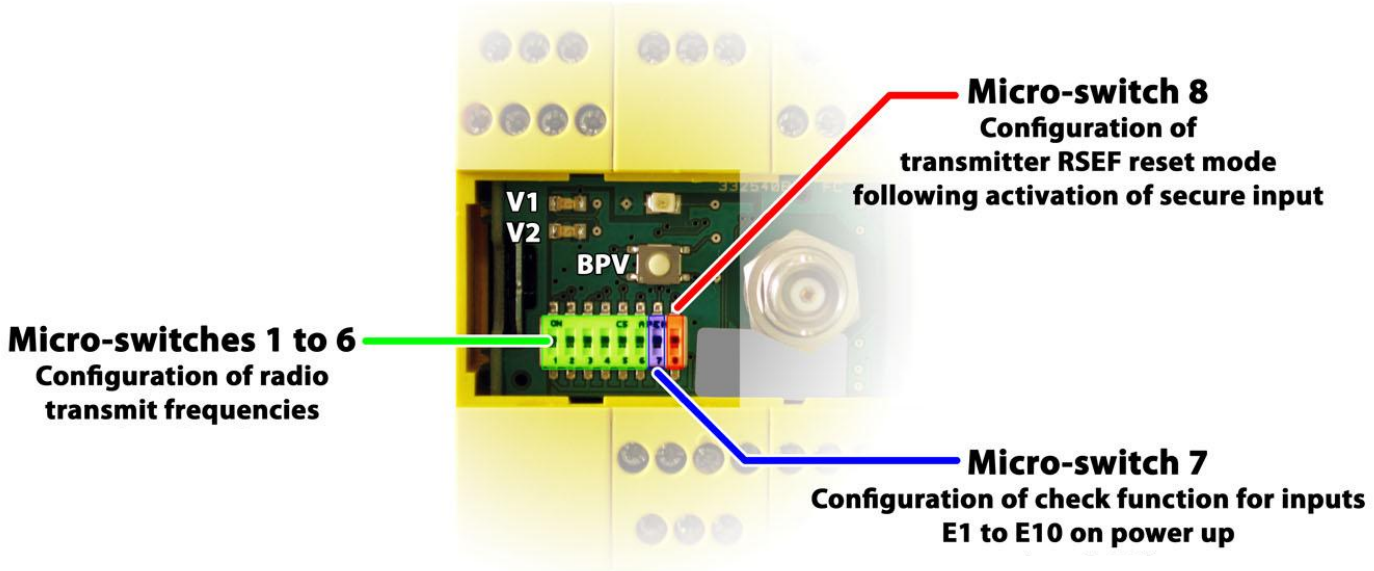
3.1. RSEF transmitter configuration

3.1.1. General process

The various settings of the RSEF transmitter can be change using **DIP switches** and a **validation button** located inside the transmitter.

To access the DIP-switches and the validation button, remove the front panel as shown in the following picture:





3.1.2. Configuring the radio transmit frequency

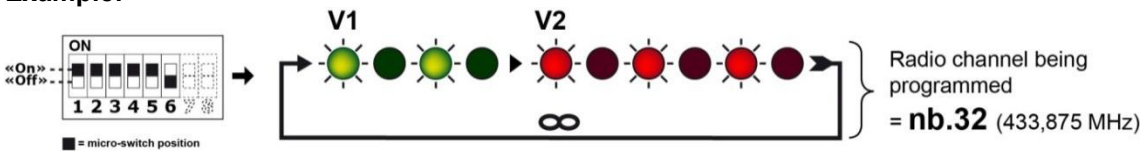
To limit accidental cut-outs due to radio interference, it is important to choose an available radio channel (frequency). This choice is governed by the following principles:

- The receiver point of installation must be considered as the centre of the radio link.
- Estimate the maximum distance **"D max"** that may be between the transmitter and the receiver.
- Identify the frequencies used for all the radio transmitters located within a radius of **2xD max**.
- Choose a frequency which is as far as possible from those used by the nearest transmitters and which is not used by the transmitters identified.

The procedure described below is used to modify the radio channel of the transmitter RSEF and receiver RSRD. The receiver must be supplied throughout the channel modification procedure to receive the radio channel change command from the transmitter RSEF.

- **Step 1:** Deactivate the safety input of the RSEF transmitter (1).
- **Step 2:** Select the new radio channel using **micro-switches 1 to 6** (see correspondence table below).
- **Step 3:** Activate the safety input of the RSEF transmitter (2).
- **Step 4:** The 2 indicator lights **V1**-**V2** flash to indicate the new radio channel being programmed:
  Indicator light **V1** (GREEN) indicates the units (0 = off steady, 1 = 1 flash, 2 = 2 flashes, etc…).
  Indicator light **V2** (RED) indicates the tens (0 = off, 10 = 1 flash, 20 = 2 flashes, etc…).

Example:



- **Step 5:** Once you chose the radio channel, press the **validation button BPV**.
- **Step 6:** The two indicator lights, **V1** and **V2**, flash simultaneously and the transmitter sends the receiver RSRD the radio channel change command (this action takes around 20 s., then indicator lights **V1** and **V2** go off).

Note: If the **validation** button **BPV** has not been pressed, you can cancel the frequency change by repositioning the micro-switches 1 to 6 to the initial radio channel code.

- **Step 7:** To exit the radio frequency setting modes, activate, then deactivate the safety input (1) (2).
- **Step 8:** If the transmitter is in "manual" restart mode, press the restart button wired to input **17**.

(1) If an emergency stop palmswitch is wired on this input, the component must be locked.
(2) If an emergency stop palmswitch is wired on this input, the component must be unlocked.

Note: If other settings need to be modified during this procedure (such as "inputs check" or "restart mode"), they need to be modified and validated one by one.

(1) If an emergency stop palmswitch is wired on this input, the component must be locked.
(2) If an emergency stop palmswitch is wired on this input, the component must be unlocked.

3.1.3. Radio channel programming table for 433-434 MHz range

Note: For the **"extended range"** version, only channels 41 to 64 are accessible.

Channel	Freq. (MHz)	DIP switches position					
		1	2	3	4	5	6
01	433.100	OFF	OFF	OFF	OFF	OFF	OFF
02	433.125	ON	OFF	OFF	OFF	OFF	OFF
03	433.150	OFF	ON	OFF	OFF	OFF	OFF
04	433.175	ON	ON	OFF	OFF	OFF	OFF
05	433.200	OFF	OFF	ON	OFF	OFF	OFF
06	433.225	ON	OFF	ON	OFF	OFF	OFF
07	433.250	OFF	ON	ON	OFF	OFF	OFF
08	433.275	ON	ON	ON	OFF	OFF	OFF
09	433.300	OFF	OFF	OFF	ON	OFF	OFF
10	433.325	ON	OFF	OFF	ON	OFF	OFF
11	433.350	OFF	ON	OFF	ON	OFF	OFF
12	433.375	ON	ON	OFF	ON	OFF	OFF
13	433.400	OFF	OFF	ON	ON	OFF	OFF
14	433.425	ON	OFF	ON	ON	OFF	OFF
15	433.450	OFF	ON	ON	ON	OFF	OFF
16	433.475	ON	ON	ON	ON	OFF	OFF
17	433.500	OFF	OFF	OFF	OFF	ON	OFF
18	433.525	ON	OFF	OFF	OFF	ON	OFF
19	433.550	OFF	ON	OFF	OFF	ON	OFF
20	433.575	ON	ON	OFF	OFF	ON	OFF
21	433.600	OFF	OFF	ON	OFF	ON	OFF
22	433.625	ON	OFF	ON	OFF	ON	OFF
23	433.650	OFF	ON	ON	OFF	ON	OFF
24	433.675	ON	ON	ON	OFF	ON	OFF
25	433.700	OFF	OFF	OFF	ON	ON	OFF
26	433.725	ON	OFF	OFF	ON	ON	OFF
27	433.750	OFF	ON	OFF	ON	ON	OFF
28	433.775	ON	ON	OFF	ON	ON	OFF
29	433.800	OFF	OFF	ON	ON	ON	OFF
30	433.825	ON	OFF	ON	ON	ON	OFF
31	433.850	OFF	ON	ON	ON	ON	OFF
32	433.875	ON	ON	ON	ON	ON	OFF

Channel	Freq. (MHz)	DIP switches position					
		1	2	3	4	5	6
33	433.900	OFF	OFF	OFF	OFF	OFF	ON
34	433.925	ON	OFF	OFF	OFF	OFF	ON
35	433.950	OFF	ON	OFF	OFF	OFF	ON
36	433.975	ON	ON	OFF	OFF	OFF	ON
37	434.000	OFF	OFF	ON	OFF	OFF	ON
38	434.025	ON	OFF	ON	OFF	OFF	ON
39	434.050	OFF	ON	ON	OFF	OFF	ON
40	434.075	ON	ON	ON	OFF	OFF	ON
41	434.100	OFF	OFF	OFF	ON	OFF	ON
42	434.125	ON	OFF	OFF	ON	OFF	ON
43	434.150	OFF	ON	OFF	ON	OFF	ON
44	434.175	ON	ON	OFF	ON	OFF	ON
45	434.200	OFF	OFF	ON	ON	OFF	ON
46	434.225	ON	OFF	ON	ON	OFF	ON
47	434.250	OFF	ON	ON	ON	OFF	ON
48	434.275	ON	ON	ON	ON	OFF	ON
49	434.300	OFF	OFF	OFF	OFF	ON	ON
50	434.325	ON	OFF	OFF	OFF	ON	ON
51	434.350	OFF	ON	OFF	OFF	ON	ON
52	434.375	ON	ON	OFF	OFF	ON	ON
53	434.400	OFF	OFF	ON	OFF	ON	ON
54	434.425	ON	OFF	ON	OFF	ON	ON
55	434.450	OFF	ON	ON	OFF	ON	ON
56	434.475	ON	ON	ON	OFF	ON	ON
57	434.500	OFF	OFF	OFF	ON	ON	ON
58	434.525	ON	OFF	OFF	ON	ON	ON
59	434.550	OFF	ON	OFF	ON	ON	ON
60	434.575	ON	ON	OFF	ON	ON	ON
61	434.600	OFF	OFF	ON	ON	ON	ON
62	434.625	ON	OFF	ON	ON	ON	ON
63	434.650	OFF	ON	ON	ON	ON	ON
64	434.675	ON	ON	ON	ON	ON	ON

3.1.4. Radio channel programming table for 911-918 MHz range

Channel	Freq. (MHz)	DIP switches position					
		1	2	3	4	5	6
01	911.800	OFF	OFF	OFF	OFF	OFF	OFF
02	911.900	ON	OFF	OFF	OFF	OFF	OFF
03	912.000	OFF	ON	OFF	OFF	OFF	OFF
04	912.100	ON	ON	OFF	OFF	OFF	OFF
05	912.200	OFF	OFF	ON	OFF	OFF	OFF
06	912.300	ON	OFF	ON	OFF	OFF	OFF
07	912.400	OFF	ON	ON	OFF	OFF	OFF
08	912.500	ON	ON	ON	OFF	OFF	OFF
09	912.600	OFF	OFF	OFF	ON	OFF	OFF
10	912.700	ON	OFF	OFF	ON	OFF	OFF
11	912.800	OFF	ON	OFF	ON	OFF	OFF
12	912.900	ON	ON	OFF	ON	OFF	OFF
13	913.000	OFF	OFF	ON	ON	OFF	OFF
14	913.100	ON	OFF	ON	ON	OFF	OFF
15	913.200	OFF	ON	ON	ON	OFF	OFF
16	913.300	ON	ON	ON	ON	OFF	OFF
17	913.400	OFF	OFF	OFF	OFF	ON	OFF
18	913.500	ON	OFF	OFF	OFF	ON	OFF
19	913.600	OFF	ON	OFF	OFF	ON	OFF
20	913.700	ON	ON	OFF	OFF	ON	OFF
21	913.800	OFF	OFF	ON	OFF	ON	OFF
22	913.900	ON	OFF	ON	OFF	ON	OFF
23	914.000	OFF	ON	ON	OFF	ON	OFF
24	914.100	ON	ON	ON	OFF	ON	OFF
25	914.300	OFF	OFF	OFF	ON	ON	OFF
26	914.400	ON	OFF	OFF	ON	ON	OFF
27	914.500	OFF	ON	OFF	ON	ON	OFF
28	914.600	ON	ON	OFF	ON	ON	OFF
29	914.700	OFF	OFF	ON	ON	ON	OFF
30	914.800	ON	OFF	ON	ON	ON	OFF
31	914.900	OFF	ON	ON	ON	ON	OFF
32	915.000	ON	ON	ON	ON	ON	OFF

Channel	Freq. (MHz)	DIP switches position					
		1	2	3	4	5	6
33	915.100	OFF	OFF	OFF	OFF	OFF	ON
34	915.200	ON	OFF	OFF	OFF	OFF	ON
35	915.300	OFF	ON	OFF	OFF	OFF	ON
36	915.400	ON	ON	OFF	OFF	OFF	ON
37	915.500	OFF	OFF	ON	OFF	OFF	ON
38	915.600	ON	OFF	ON	OFF	OFF	ON
39	915.700	OFF	ON	ON	OFF	OFF	ON
40	915.800	ON	ON	ON	OFF	OFF	ON
41	915.900	OFF	OFF	OFF	ON	OFF	ON
42	916.000	ON	OFF	OFF	ON	OFF	ON
43	916.100	OFF	ON	OFF	ON	OFF	ON
44	916.200	ON	ON	OFF	ON	OFF	ON
45	916.300	OFF	OFF	ON	ON	OFF	ON
46	916.400	ON	OFF	ON	ON	OFF	ON
47	916.500	OFF	ON	ON	ON	OFF	ON
48	916.600	ON	ON	ON	ON	OFF	ON
49	916.700	OFF	OFF	OFF	OFF	ON	ON
50	916.800	ON	OFF	OFF	OFF	ON	ON
51	916.900	OFF	ON	OFF	OFF	ON	ON
52	917.000	ON	ON	OFF	OFF	ON	ON
53	917.100	OFF	OFF	ON	OFF	ON	ON
54	917.200	ON	OFF	ON	OFF	ON	ON
55	917.300	OFF	ON	ON	OFF	ON	ON
56	917.400	ON	ON	ON	OFF	ON	ON
57	917.500	OFF	OFF	OFF	ON	ON	ON
58	917.600	ON	OFF	OFF	ON	ON	ON
59	917.700	OFF	ON	OFF	ON	ON	ON
60	917.800	ON	ON	OFF	ON	ON	ON
61	917.900	OFF	OFF	ON	ON	ON	ON
62	918.000	ON	OFF	ON	ON	ON	ON
63	918.100	OFF	ON	ON	ON	ON	ON
64	918.200	ON	ON	ON	ON	ON	ON

3.1.5. Radio channel programming table for 920 MHz range

Channel	Freq. (MHz)	DIP switch position					
		1	2	3	4	5	6
01	920.6	OFF	OFF	OFF	OFF	OFF	ON
02	920.8	ON	OFF	OFF	OFF	OFF	ON
03	921.0	OFF	ON	OFF	OFF	OFF	ON
04	921.2	ON	ON	OFF	OFF	OFF	ON
05	921.4	OFF	OFF	ON	OFF	OFF	ON
06	921.6	ON	OFF	ON	OFF	OFF	ON
07	921.8	OFF	ON	ON	OFF	OFF	ON
08	922.0	ON	ON	ON	OFF	OFF	ON
09	922.2	OFF	OFF	OFF	ON	OFF	ON
10	922.4	ON	OFF	OFF	ON	OFF	ON
11	922.6	OFF	ON	OFF	ON	OFF	ON
12	922.8	ON	ON	OFF	ON	OFF	ON
13	923.0	OFF	OFF	ON	ON	OFF	ON
14	923.2	ON	OFF	ON	ON	OFF	ON
15	923.4	OFF	ON	ON	ON	OFF	ON

20mW (13dBm)

Channel	Freq. (MHz)	DIP switch position					
		1	2	3	4	5	6
16	928.15	ON	ON	ON	ON	OFF	ON
17	928.25	OFF	OFF	OFF	OFF	ON	ON
18	928.35	ON	OFF	OFF	OFF	ON	ON
19	928.45	OFF	ON	OFF	OFF	ON	ON
20	928.55	ON	ON	OFF	OFF	ON	ON
21	928.65	OFF	OFF	ON	OFF	ON	ON
22	928.75	ON	OFF	ON	OFF	ON	ON
23	928.85	OFF	ON	ON	OFF	ON	ON
24	928.95	ON	ON	ON	OFF	ON	ON
25	929.05	OFF	OFF	OFF	ON	ON	ON
26	929.15	ON	OFF	OFF	ON	ON	ON
27	929.25	OFF	ON	OFF	ON	ON	ON
28	929.35	ON	ON	OFF	ON	ON	ON
29	929.45	OFF	OFF	ON	ON	ON	ON
30	929.55	ON	OFF	ON	ON	ON	ON
31	929.65	OFF	ON	ON	ON	ON	ON

1mW (0dBm)

Channel transmission operating mode:

- **Radio transmission mode for channels 01 to 15 (20mW):**
  - A strict frequency plan must be put in place to ensure that the chosen channel is available.
  - Each transmission cycle consists of 3 phases:
    - **Listening phase:** The selected channel must be free of any signal for 5ms before starting the transmission phase. In the case it is busy, the transmitter stays on listening until the channel happens to be free for 5ms.
      After 300ms without any transmission possibility, the red led V2 will be activated for information, but the system stays on listening until the channel is free for 5ms.
      It is necessary to press the white validation button for 4 seconds to reset the red led V2 (or switch off/on the transmitter).
    - **4-seconds transmission phase:** Normal transmission of radio frames.
    - **50-ms pause phase:** No radio function at all during 50ms prior to the listening phase.

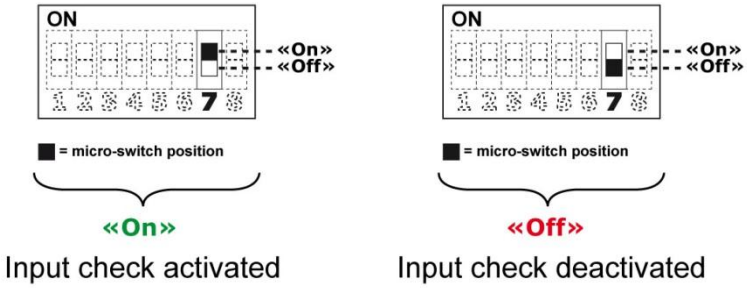
- **Radio transmission mode for channels 16 to 31 (1mW):**
  - A frequency plan remains recommended for all radio applications.
  - The safety signal is transmitted approximately every 100ms, for a duration of approximately 50ms.
  - The analysis of the radio signal quality shows a value close to 50% corresponding to the 50% duty cycle: the signal must not be polluted by third-party sources.
  - If it is necessary to go beyond the range of the RSEF transmitter, the use of a JUMP repeater will be carried out with additional synchronization to the initial duty cycle.

3.1.6. Configuring the check function for inputs E1 to E10 on power up

This function is used to check the status of the contacts of the inputs when the RSEF transmitter is powered up. If a contact is “closed” during the power up, the transmitter will indicate an error using indicator lights **V1** and **V2** (4 flashes).

This function can be activated using **micro-switch No. 7.**

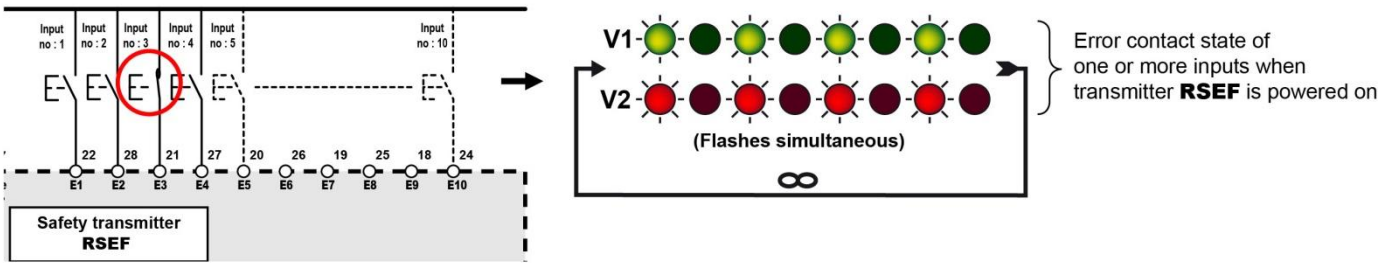
- **Step 1:** Deactivate the safety input of the transmitter RSEF (1).
- **Step 2:** Activate or deactivate the input check function using **micro-switch No. 7**:



- **Step 3:** Activate the safety input of the RSEF transmitter (2); the two indicator lights, **V1** and **V2**, flash alternately to indicate the system is on standby for validation.
- **Step 4:** Press the **validation button BPV**; indicator lights **V1** and **V2** go off.
- **Step 5:** To exit this configuration mode, deactivate, then activate the safety input (1) (2).
- **Step 6:** If the transmitter is in « manual » restart mode, press the restart button wired to input **17**

(1) If an emergency stop palmswitch is wired on this input, the component must be locked.
(2) If an emergency stop palmswitch is wired on this input, the component must be unlocked.

Example of fault on input No. 3 (NO contact faulty):



Note: If the other setting has also been modified during this procedure (as “Radio channel number” or “restart mode”), each modified setting must be performed one by one.

3.1.7. Configuring the restart mode of transmitter RSEF

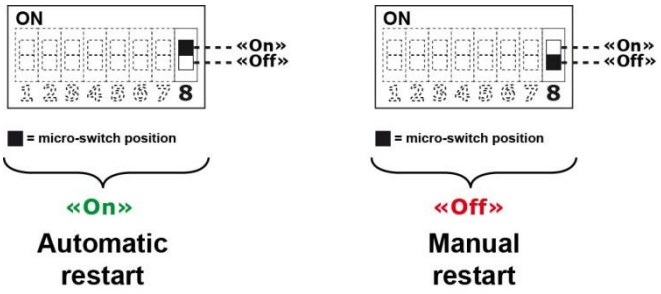
This function defines the restart mode of safety transmitter (activation of the radio transmission) after a stop caused by deactivation of its safety input (i.e.: emergency stop button pressed) or cut of its power supply. By default ("ex-factory"), the transmitter restart mode is **"Manual"**.

- **"Manual"** restart mode:
  The safety transmitter is manually restarted (radio transmission activated) by pressing on a « Restart » pushbutton following deactivation and activation of its safety input.

- **"Automatic"** restart mode:
  The safety transmitter is automatically restarted (radio transmission activated) following deactivation and activation of its safety input.
  IMPORTANT: Do not connect a restart button in this mode (input nb.17 not connected).

This function is configured using **micro-switch No. 8**

- **Step 1:** Deactivate the safety input of the transmitter RSEF (1).
- **Step 2:** Using **micro-switch No. 8**, select the transmitter restart mode: "Automatic" or "Manual":



- **Step 3:** Activate the safety input of the transmitter RSEF (2); the two indicator lights, **V1** and **V2**, flash alternately to indicate the system is on standby for validation.
- **Step 4:** Press the validation button (**BPV**); indicator lights **V1** and **V2** go off.
- **Step 5:** To exit this configuration mode, deactivate, then activate the safety input (1) (2).

(1) If an emergency stop palmswitch is wired on this input, the component must be locked.
(2) If an emergency stop palmswitch is wired on this input, the component must be unlocked.

Wiring diagram with restart button (« manual » restart mode):
In the event of deactivation followed by activation of the safety input (emergency stop, for example), the transmitter will only be able to transmit provided the "restart" pushbutton has been pressed.

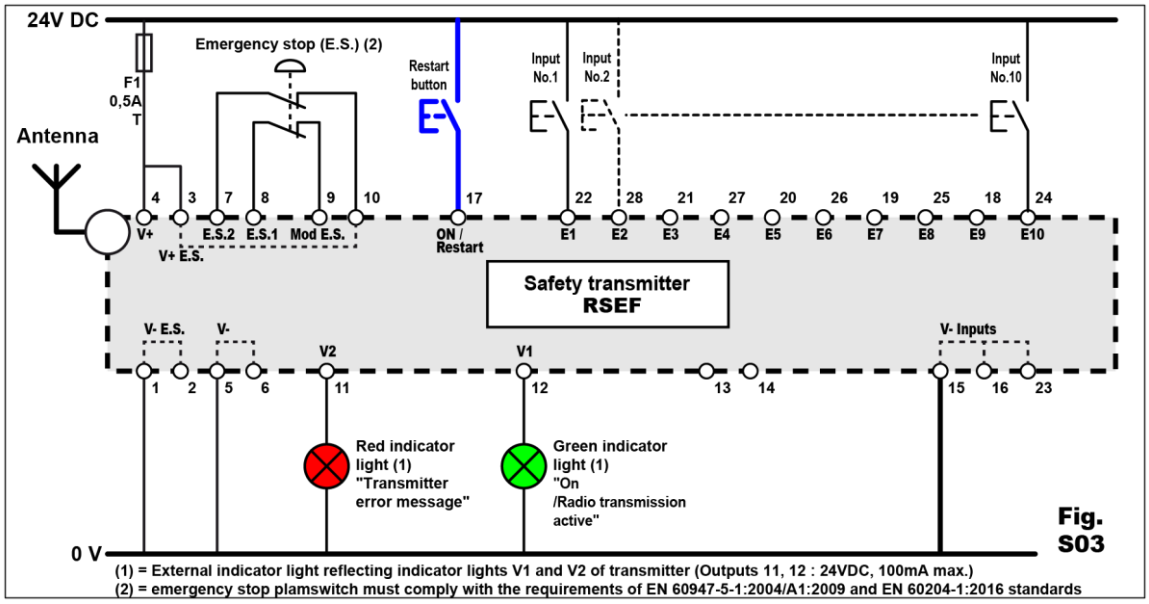


Fig. S03

Note: If the other setting has also been modified during this procedure (as "Radio channel number" or "restart mode"), each modified setting must be performed one by one.

3.2. RSRD receiver configuration

3.2.1. General principle

The **RSRD** receiver can be set onto one of two following operating modes:

Programming mode or **Configuration mode**	This mode triggers the opening of the safety relays
Receiver mode or **Diagnosis mode**	This mode is used for normal operation

To change the operating modes there are two possibilities:

Use the physical switch SW1	Switch SW1 up for normal operation
Use the configuration input (4-6/J3)	Deactivate this input for normal operation

When the **RSRD** receiver is set to **Programming mode**, the serial link terminals 1-3-5 on J3 terminal block allows to configure the RSRD receiver:

With the help of DialogRSRDevice software	Use dedicated RSW39 cable to connect on a laptop/PC

The following additional support and documentations are available:

RS232 protocol instructions	Please refer to JAY Electronique
DialogRSRDevice software guidelines	Please refer to JAY Electronique

The dedicated programming software DialogRSRDevice is available on JAY Electronique website. The use of such software is protected by a password. Passwords, or RS232 protocol instructions, are only delivered to “level 2” skilled person (a person who was trained by JAY Electronique, and who was authorized to modify RSRD receiver parameters).

3.2.2. Safety delay

The “Safety delay” allows to generate a delay before the deactivation of **RS1** and **RS2** safety relays.

The purpose of this timer is:

- To indicate a system stop to the equipment to manage an action before the complete shutdown**,**
- To keep an immediate start of the safety stop process (to be executed by at the end of the delay).

This timer is activated after an emergency stop signal from the **RSEF** transmitter and after a passive stop (radio loss).

Total Tripping time = Active stop time or Passive stop time + Safety delay

This timer is not considered in the following cases:

- During a local emergency stop (E-stop pushbutton wired to the RSRD receiver **J2**-03,04,05,06),
- When a wired enabling handle is used (connected to receiver RSRD **J2**-07,08,09,10,11,12),
- Or when a system error occurs.

This timer can be set to a value from 0s to 10s (steps of 1s) in Programming mode (see previous section).

IMPORTANT: According to Machinery Directive, Clause §4.1.1 (EN ISO 13850:2015), all time delays must be determined based on the risk assessment of the machine. Please also refer to EN 60204-1:2018, Clause §9.2.3.4.2.

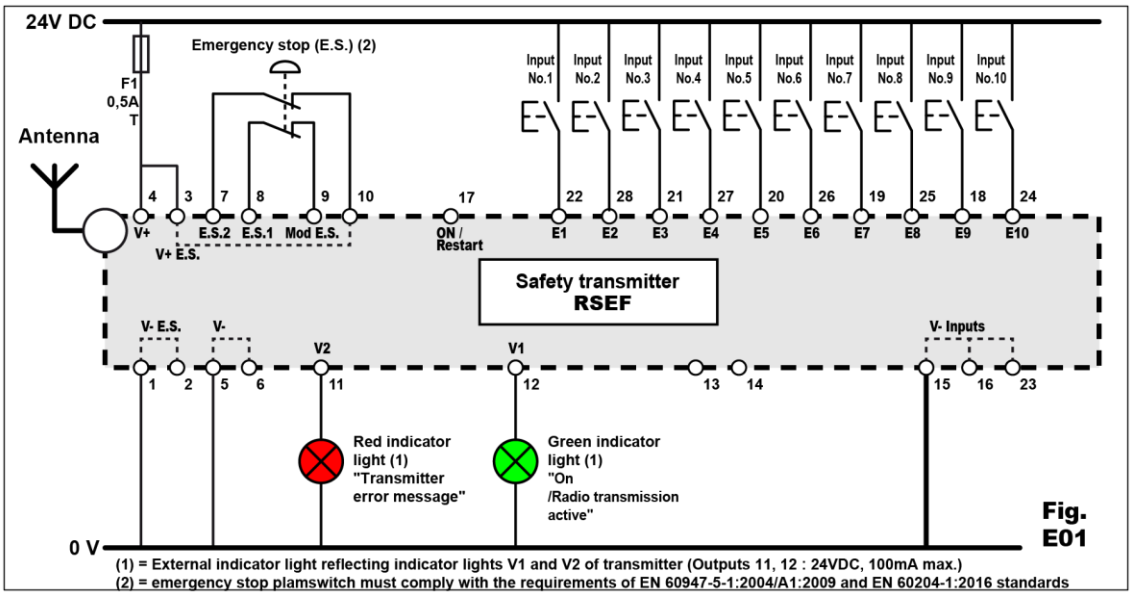
4. Products wiring

4.1. Wiring the transmitter RSEF

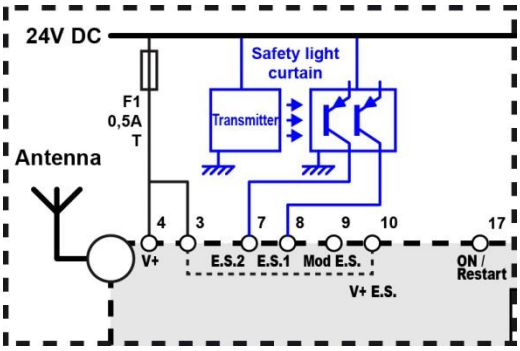
NOTE 1: See the description of the terminals connection in section **4.2.1**.
NOTE 2: See the correspondence between RSEF transmitter inputs and RSRD receiver outputs in section **2.4.1**.

4.1.1. Typical wiring diagram

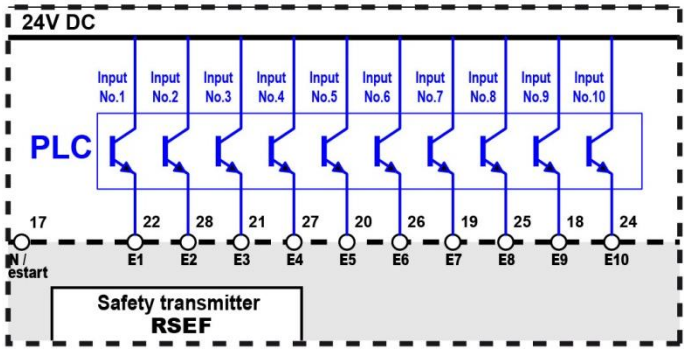
This typical wiring diagram is realized with an emergency stop palmswitch connected to the safety inputs and 10 dry-contact inputs (No pushbuttons).



4.1.2. Connection example of a safety light curtain on transmitter safety input



4.1.3. Example with static inputs (PLC for example)



4.2. Wiring the receiver RSRD

NOTE 1: See the description of the terminals connection in section **4.2.3.**
NOTE 2: See correspondence between RSEF transmitter inputs and RSRD receiver outputs in section **4.2.4**.
CAUTION: The loads connected to the receiver outputs must not consume more than 100mA with 24VDC.

4.2.1. Multi-strand wires: use of wire end ferrules is mandatory

Where flexible multi-strand wires are used, wires end ferrules must be used to avoid false contacts and short-circuits.

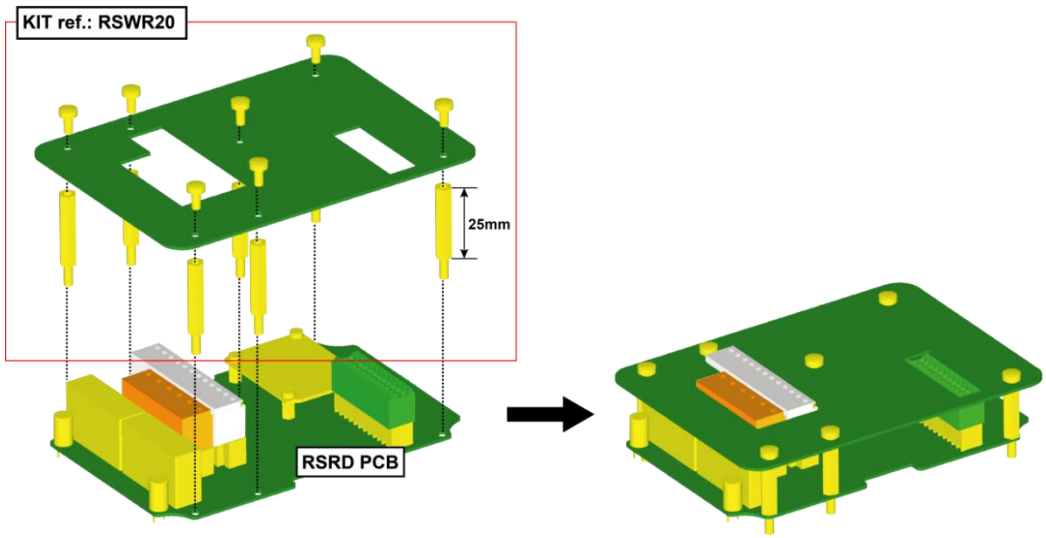
4.2.2. Conductor wire sections to be observed

The electrical connection of the terminal blocks must be realized with the following wire sections:

Terminal block	Min / Max sections
J1 & J2	0,5mm² to 1,5mm²
J3	0,25mm² to 1,5mm²

4.2.3. USA/Canada specifications for installation and conductor wires to be used

- **The circuit breaker supplying the RSRD must be accessible and close to the RSRD.**
- **The type of wires used for wiring the J1 Terminal block (Safety relay outputs) must be:**
  Class 1, size 18AWG with a minimum temperature range of -35°C to +60°C.
- **Warning:** If the voltage applied to the terminal J1 is greater than 30 Vrms, 42.4 Vpeak, or 60 Vdc, the installer must place the PCB version in a cabinet (not provided by JAY Electronique). This assembly must be realized in accordance with the installation instructions defined in section 7.4. The installation must comply with the rules for mechanical insulation, fire insulation defined in the UL 61010-1 standard. A mounting kit ref.: RSWR20 must be used (see figure below) to provide a barrier between the wires and the board. The installer must warrant that no wires can touch the board.



4.2.4. RS1-RS2 safety relays operation of RSRD receiver

The interruption of the safety stop chain is ensured by **RS1** and **RS2** safety relays (internal to the RSRD receiver) which control the contacts accessible by terminals **Y1-Z3**, **Y2-Z2** and **Y3-Z1**.

The **RS1** and **RS2** safety relays states depend on:

- The safety input of the RSEF transmitter,
- The safety input of the RSRD (1) receiver,
- Possible faults detected,
- The possible radio link loss,
- The possible power supply loss of the safety transmitter or the safety receiver,
- The possible enabling handle status (2).

*(1) An external safety stop device can be connected, such as an emergency stop palmswitch, or a gate control device wired to the inputs provided for this purpose on the receiver (connection terminals **J2 03-04** / **J2 05-06**). These inputs states will act directly on **RS1** and **RS2** safety relays.*

*(2) An enabling handle can be wired to the inputs provided for this purpose on the receiver (connection terminals **J2 07-08** / **J2 09-10** and **J2-11-12**). These inputs states will act directly on **RS1** and **RS2** safety relays and change the receiver operating mode, see section 6.2.6.*

4.2.5. Main contactors monitoring

The input connected to terminals **J3 13-14** is used to monitor the contactor(s) state(s) connected to the **RS1-RS2** safety relays outputs.

The state of the contactor(s) contact(s) wired on this input must be closed to start the RSRD receiver.

IMPORTANT: This monitoring depends on the safety performance level required by the machine.

4.2.6. Enabling handle: Wiring and operating mode

IMPORTANT: The enabling handle must comply with the requirements of IEC 60947-5-1 / EN 60947-5-1, IEC 60947-5-8 / EN 60947-5-8 and IEC 60204-1 / EN 60204-1 standards.

The RSRD receiver is provided with six inputs dedicated to the wiring of an enabling handle.

In the case an enabling handle is used, four of these inputs will be used for the connection of the double channel enabling handle. And the two other inputs will be used for the enabling handle detection.

The wireless emergency stop function is then bypassed by the dual channel enabling handle.

When the enabling handle is detected, the receiver will reset and the radio is disabled.

The enabling handle has a higher priority than the radio mode. However, it has a lower priority than the local emergency stop wired on the RSRD receiver.

In the event of a faulty enabling handle, the safety relays shall be immediately deactivated.

4.2.7. Typical wiring diagram for RSRD receiver

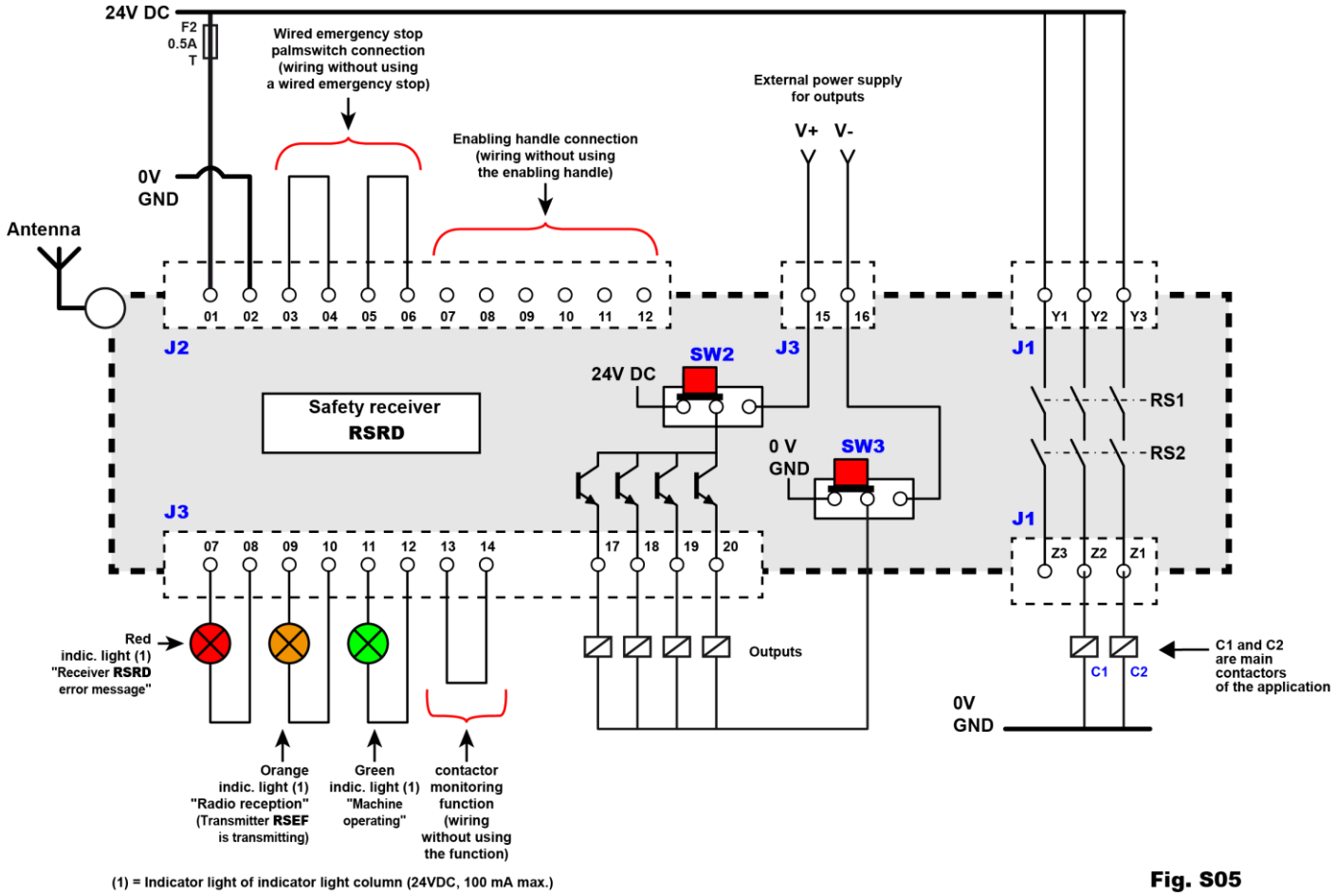
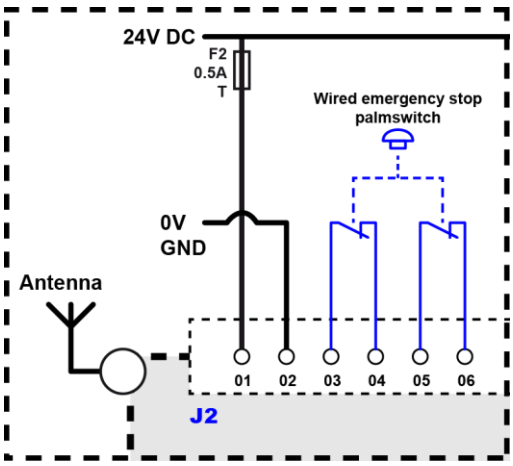


Fig. S05

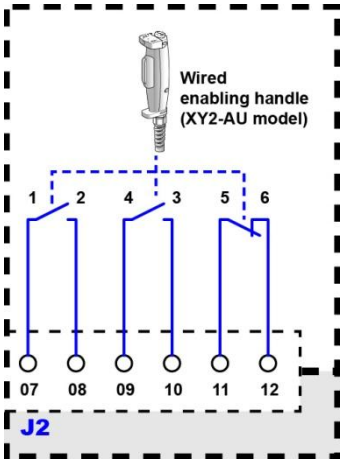
4.2.8. Example with wired emergency stop button

IMPORTANT: The emergency stop palmswitch must comply with the requirements of IEC 60947-5-1 / EN 60947-5-1, IEC 60947-5-5 / EN 60947-5-5 and IEC 60204-1 / EN 60204-1 standards.

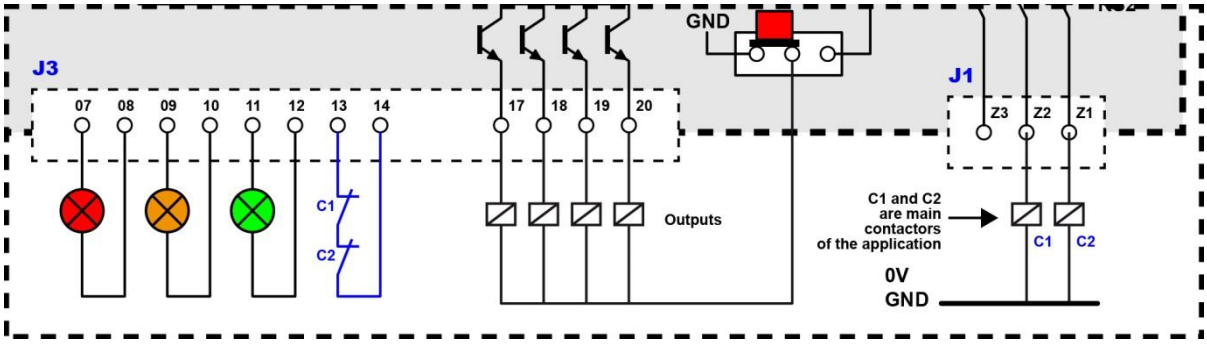


4.2.9. Example with wired enabling handle

IMPORTANT: The enabling handle must comply with the requirements of IEC 60947-5-1 / EN 60947-5-1, IEC 60947-5-8 / EN 60947-5-8 and IEC 60204-1 / EN 60204-1 standards.



4.2.10. Example with contactor monitoring function



4.2.11. Beacon light column wiring

A beacon light column should be wired to the receiver. The column will indicate the status of both the monitored equipment and the RSRD receiver. The indicator light status sheet should be fastened near to the indicator light column. An example is given in the next of this user manual.

The consumption of each indicator light of the column must not exceed 100mA with 24VDC. Should this be the case, the indicator lights must be controlled by auxiliary relays.

IMPORTANT: A standard indicator light column does not provide safe information. The correct operation of the lights is not certified.

Status of beacon lights of indicator light column:

Ind. light column	On steady state	Flashing	OFF
Red	Equipment stopped	Red indicator light flashes a specific number of times in the event of a receiver malfunction (see chapter 8.2)	Equipment operating
Orange	Active radio link between transmitter and receiver	/	/
Green	Equipment operating	/	Equipment stopped

STOP

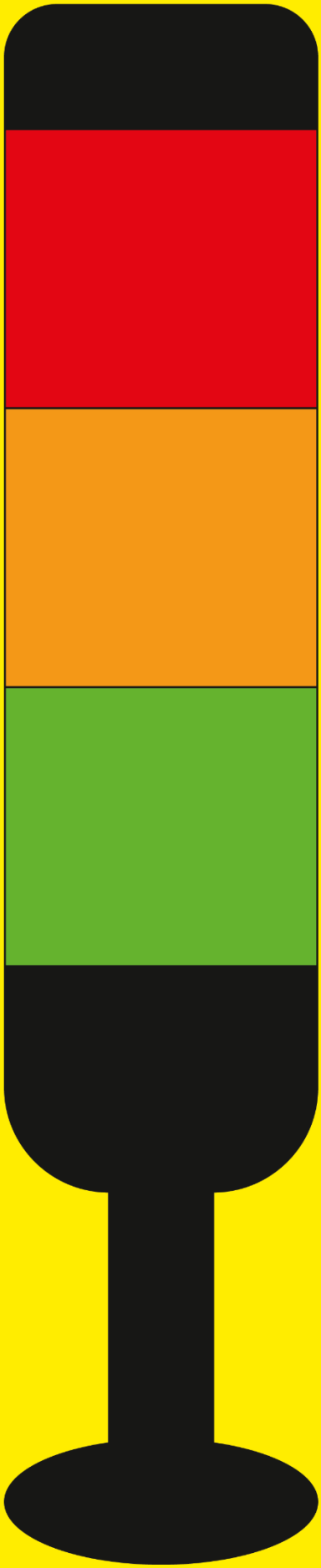
Machine emergency stop triggered

Active radio link between transmitter and receiver

(Receiver indicator light feedback)

OK

Equipment operating



5. Instructions for safe installation and commissioning

5.1. General information

Based on the experience, the functional reliability of the system basically depends on:

- The quality of the electrical power supply and protection systems,
- The characteristics of the components connected to the transmitter and the receiver,
- The position of the transmission and reception antennas,
- And the configuration and the wiring of the various components.

5.2. RSEF transmitter

The installer shall:

- Install the product near the control area,
- Provide, if necessary, a location for a transmitter restart button to restart the transmitter due to a malfunction or following an emergency stop condition,
- Connect a 0.5-amp delay-action fuse protection device in series on transmitter input Vin No. **4** (24VDC),
- And familiarise operators with all the characteristics detailed in the “technical characteristics” appendix.

5.3. RSRD receiver

The installer shall:

- Respect the sections and characteristics of the cables to be used (see the “technical characteristics” appendix),
- Wire a cabled emergency stop device on the unit front panel,
- Secure, on the top of the unit, a 3-color indicator light column (green, orange, red) to indicate the operating status of the system,
- Fasten, near the indicator light column, a colour code sheet showing the meaning of the indicator light statuses (example shown in the previous page of this user manual),
- Connect a 0.5-amp delay-action fuse protection device in series on input **J2-01** (24V DC) of the receiver,
- And familiarise operators with the characteristics detailed in the “technical characteristics” appendix.

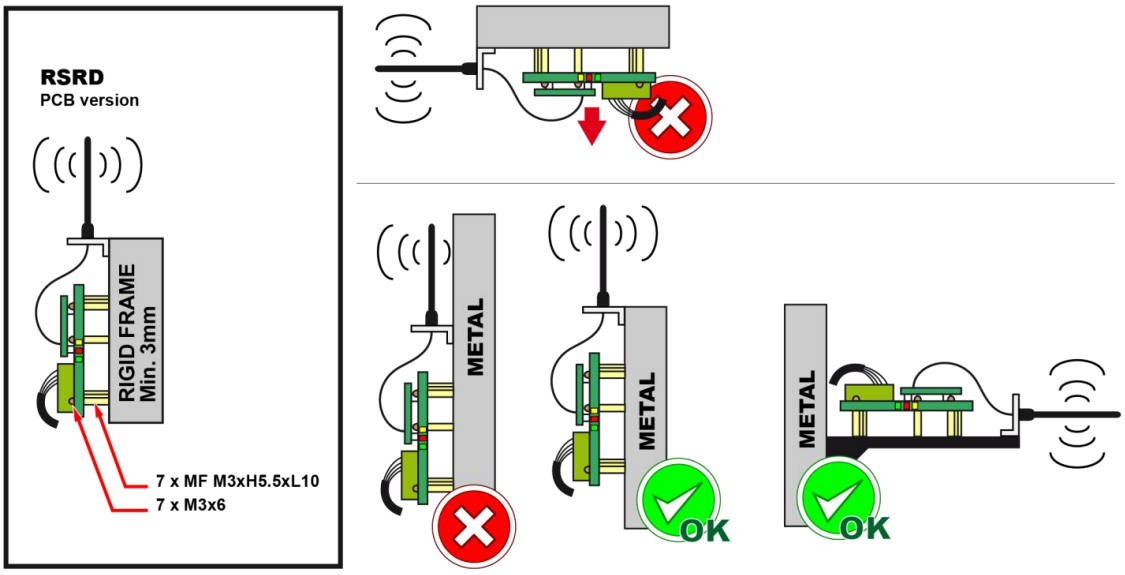
5.4. Components and antennas positioning

Please follow recommendations of installation of the antenna to obtain the best radio signal.

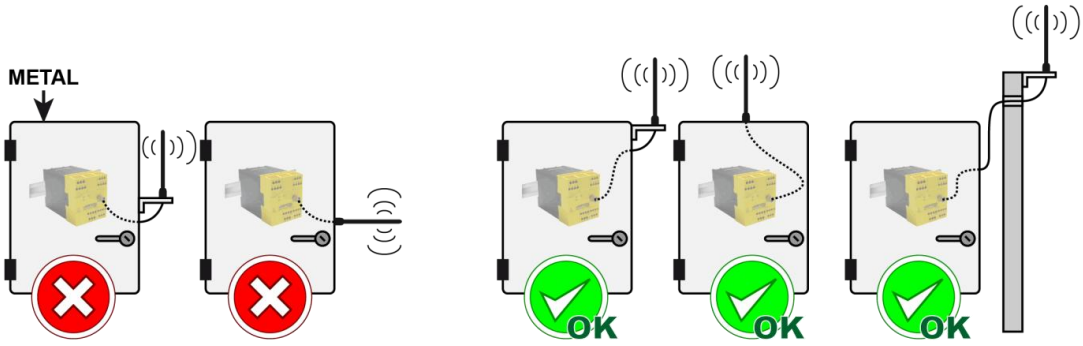
- When multiple transmitters are installed side by side, the respective radio transmission antennas should be at least spaced of 70cm.
- If a metal electrical housing is used, the antenna should be remote mounted on the top of the housing.
- If a plastic housing is used, the antenna can be connected directly on the product using the BNC elbow supplied.
- Under no circumstances, the RSRD receiver shall be positioned with its electronic components facing down.
- According to IEC 13849-2, the RSRD receiver must be mounted in an IP54 (minimum) enclosure. A risk analysis must be performed to ensure that IP54 is sufficient to exclude short-circuit faults in your environment.
- The RSRD receiver must be installed on a rigid frame (3 mm thick sheet metal). The PCB must be fastened by 7 brass spacers MF M3xH5.5xL10 screwed into the frame. The PCB must be fastened on these spacers by 7 round head screws M3x6 (diameter of head: 6mm).
- If poor radio wave propagation is observed, for example: closed area, the antenna should be remote-mounted.

The picture below details the instructions for a good installation:

Receiver **RSRD :**



Transmitter **RSEF :**

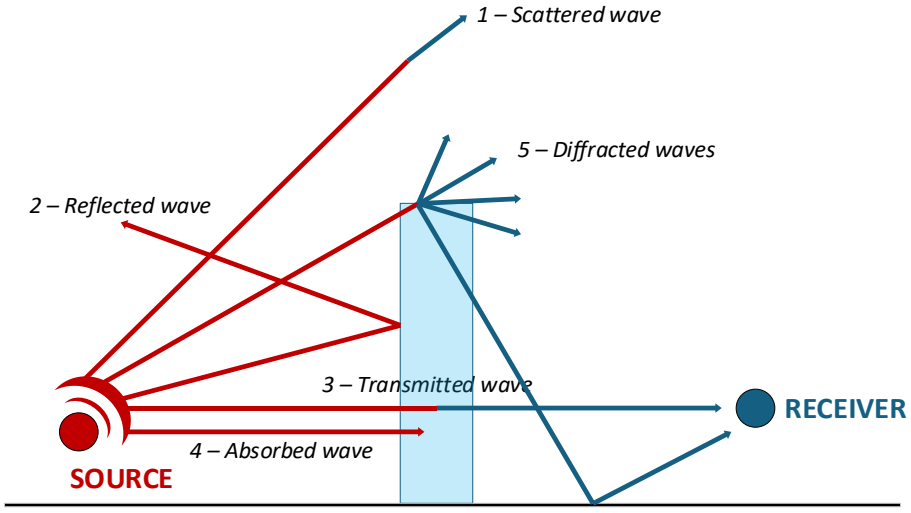


IMPORTANT: Do not remove the plastic insulating washer placed between the nut and the BNC connector mounted on the bracket of the antenna extension.

6. Optional radio components

6.1. Wave propagation – Preamble

In some environments, it is sometimes difficult to get a sufficiently stable radio quality to ensure an operation without any unintentional stops. Indeed, when it comes to radio wave, many parameters must be considered, and each one can have influence on the wave propagation. Some materials will absorb the radio signal whereas others will reflect it leading sometimes to a diffuse message or a totally missing message in some specific positions.



Some parameters which can influence waves propagation are listed below:

- The number of obstacles and their nature (reflecting or absorbing materials),
- The number of moving vehicles,
- Vehicles nature as well as their transported materials,
- And reception and emission antennas positioning.

This last parameter is the one that interests us here. As space is generally limited to increase the number of antennas from the machines side (and so from the “reception” side), the aim is to increase the number of radio emission spots in the enclosure, using various accessories described on the following chapters, to reduce the impact of these phenomena.

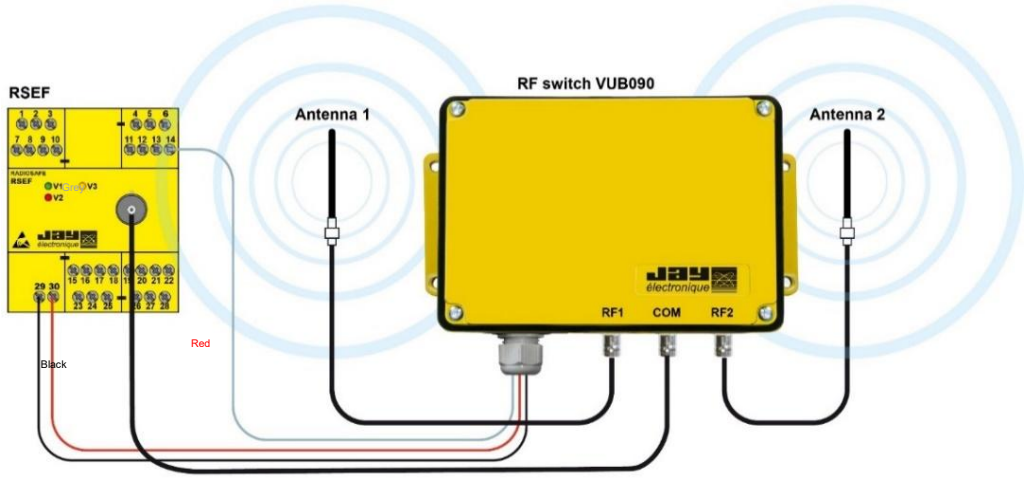
6.2. VUB090 – RF switch 2 outputs

The RF switch is an optional component for RSEF with sales reference RSEF** - 1.

This option ensures continuous radio link in congested RF environments (reflections, shadow zones, etc.) by controlling a RF switch to transmit radio waves from two separate antennas alternatively.

The RSEF** - 1 transmitter is fitted with 2 extra outputs, terminals **29** and **30**, which deliver the power supply to the RF switch as well as the TTL output (terminal 14) to control the RF switch. See wiring diagram here below.

IMPORTANT: The total length of coaxial cables connected the RSEF and the RF switch shall not exceed 30m.



RSEF terminal	RF switch connection	Cable colour
14	TTL	Please refer to label on the product for wiring
29	0 V	
30	+5 VDC	
RF Signal	COM	

6.3. RSswitch – RF switch 2/4 outputs

The RSswitch is an accessory for **RSEF** transmitters and **JUMP** repeaters.

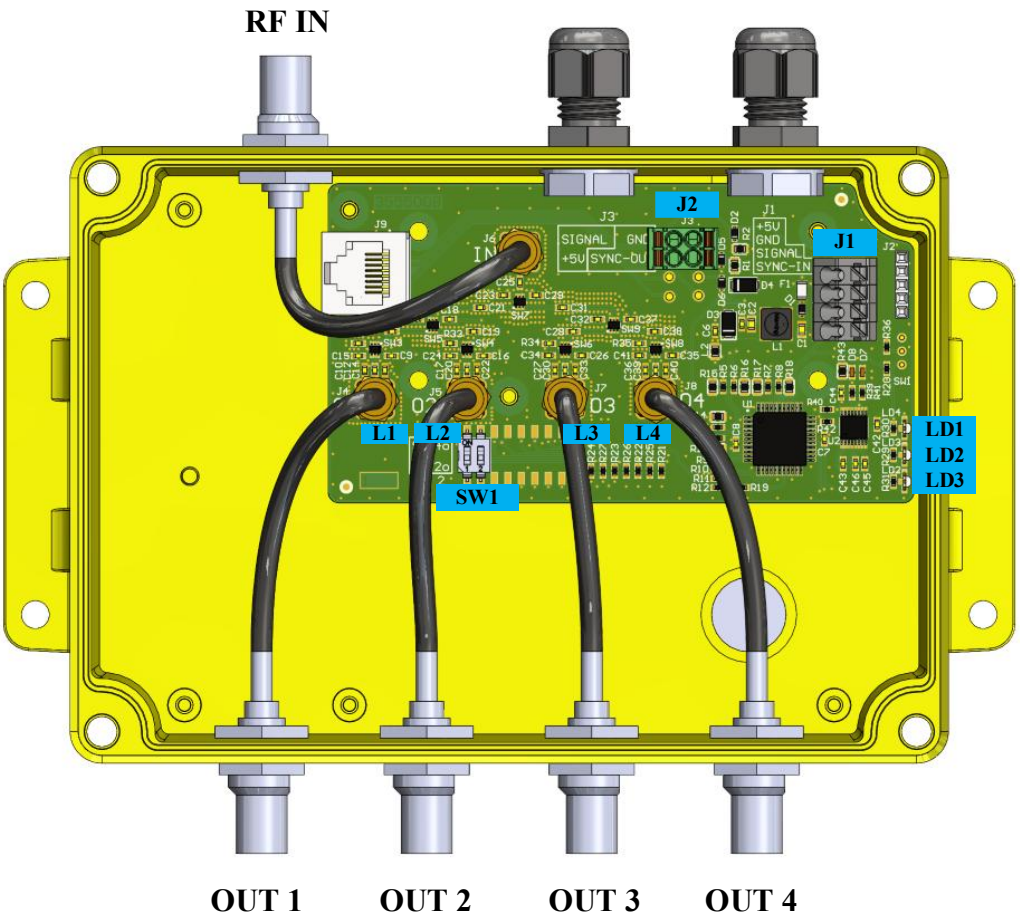
This accessory allows to ensure a continuous and stable radio link in a difficult RF environment (obstacles, reflections, shadow zones, etc..) by controlling a RF switch to multiply the radio emission spots and so, reduce efficiently the radio losses due to the environment.

This switch allows to choose the number of emission spots according to the need:

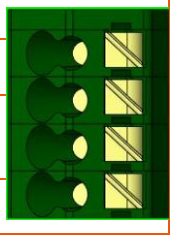
- 2 antennas for standard environments,
- 4 antennas for complex environments.

It also provides the possibility to synchronize several radio switches between each other to operate them in parallel in very severe use cases (isolated pieces by very thick and/or metallic walls).

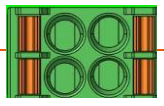
The transmission time on an antenna is 6 frames (about 100ms) before switching to the next one.



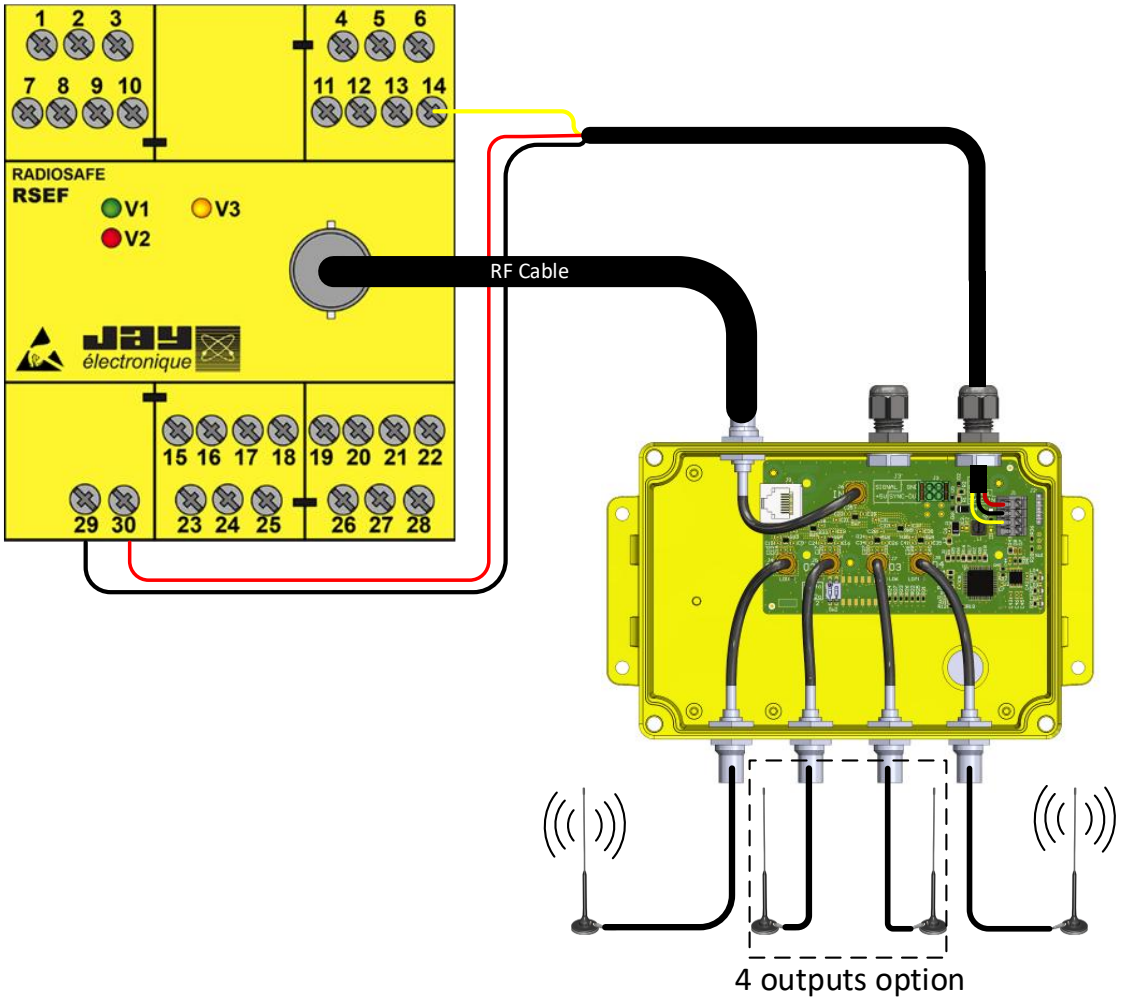
Indicator lights			
LD1	Yellow indicator light: Switch power supply OK	L1	RF1 output indicator light
LD2	Red indicator light: Error	L2	RF2 output indicator light
LD3	Green indicator light: TTL reception signal	L3	RF3 output indicator light
		L4	RF4 output indicator light

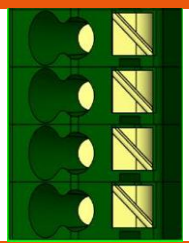
J1 terminal block: Power supply & TTL Signal		
Function	**Terminals**	
V+ power supply (+5V)	1	
GND	2	
TTL input (synchronization signal) → From RSEF/Jump if RSswitch “Master” → From previous RSswitch if RSswitch “Slave”	3	
Synchro input (Slave)	4	

Switch SW1: Operation modes		
Function	**N°**	
“Master” or “Slave” mode	1	
“2-channels” or “4-channels” mode	2	

J2 terminal block: Power supply & Master/Slave TTL Signal (Only wire if several RSswitch are used)				
Function	**Terminals**			**Function**
TTL output (to RSswitch Slave)	2		1	GND
V+ output (+5V)	4		3	Synchro output (Master)

6.3.1. RSswitch wiring



RSEF terminals	Connection to RSswitch		Description
30	**1**		+5V
29	**2**		GND
14	**3**		Command signal of RF switches
NA	**4**		Synchronization signal from the « Master » RSswitch → *Only wire if several RSswitches are used*

- **Step 1:** Power off the RSEF transmitter.
- **Step 2:** Wire the RSswitch as indicated above.
- **Step 3:** Power up the RSEF transmitter.
- **Step 4:** Unlock the RSEF transmitter emergency stop.
  - LD1 must switch on.
  - Push the restart button if the RSEF is configured in manual restart mode.
  - LD3 flashes fast (5 times per second). The RSswitch receives the RSEF switching commands.
  - L1 to L4 indicator lights show the activated outputs.

6.3.2. RSswitch configuration

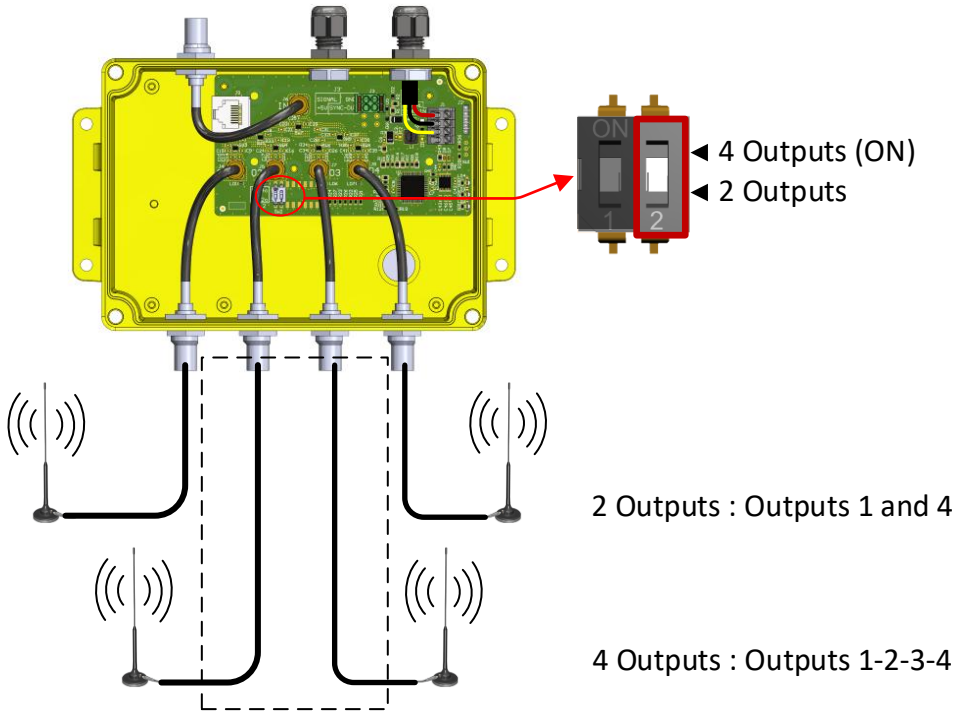
6.3.2.1. 2-way or 4-way mode

The DIP Switch N°2 on SW1 allows to choose between:

- The use of only 2 ways: ***(Default setting)***
  This mode is recommended for most of the applications without specific constraints.

- The use of 4 ways:
  This mode is recommended for applications in complex environments with many obstacles and/or different stages coming disturb the radio signal transmission. (Ex: Mobile vehicles in shelving in 3 dimensions)

NOTE: According to the number of obstacles, it is sometimes necessary to add other radio emission spots; to do this, it is possible to connect a second (or more) RSswitch in series. (See next chapter)



The change mode can be done using the DIP Switch N°2 on SW1:

- DIP Switch N°2 on **OFF**: Configuration in ***2-Way*** mode:
  In this mode, the RSswitch will send radio frames alternatively on outputs **1 and 4**.
  Leds V1 and V4 switch on as soon as the corresponding RF output is active.

- DIP Switch N°2 on **ON**: Configuration in ***4-Way*** mode:
  In this mode, the RSswitch will send radio frames alternatively on outputs **1, 2, 3 and 4**.
  Leds V1, V2, V3 and V4 switch on as soon as the corresponding RF is active.

NOTE: The transition from one mode to the other one can be done when the switch is in operation.

6.3.2.2. Use of several RSswitch for one transmitter

The DIP Switch N°1 on SW1 allows to choose between:

- A RSswitch configuration in **"Master"** mode. ***(Default setting)***
  - **An alone RSswitch will always be configured in this position.**
- A RSswitch configuration in **"Slave"** mode.
  - When several RSswitch are used, only one must be configured in **"Master"** mode and the others must be configured in **"Slave"** mode.

In some cases, the use of only one RSswitch and its 4 transmission channels doesn't allow to get a sufficiently clean and linear radio coverage across the entire installation. Then, there is the possibility to add one (or more) additional RSswitch.

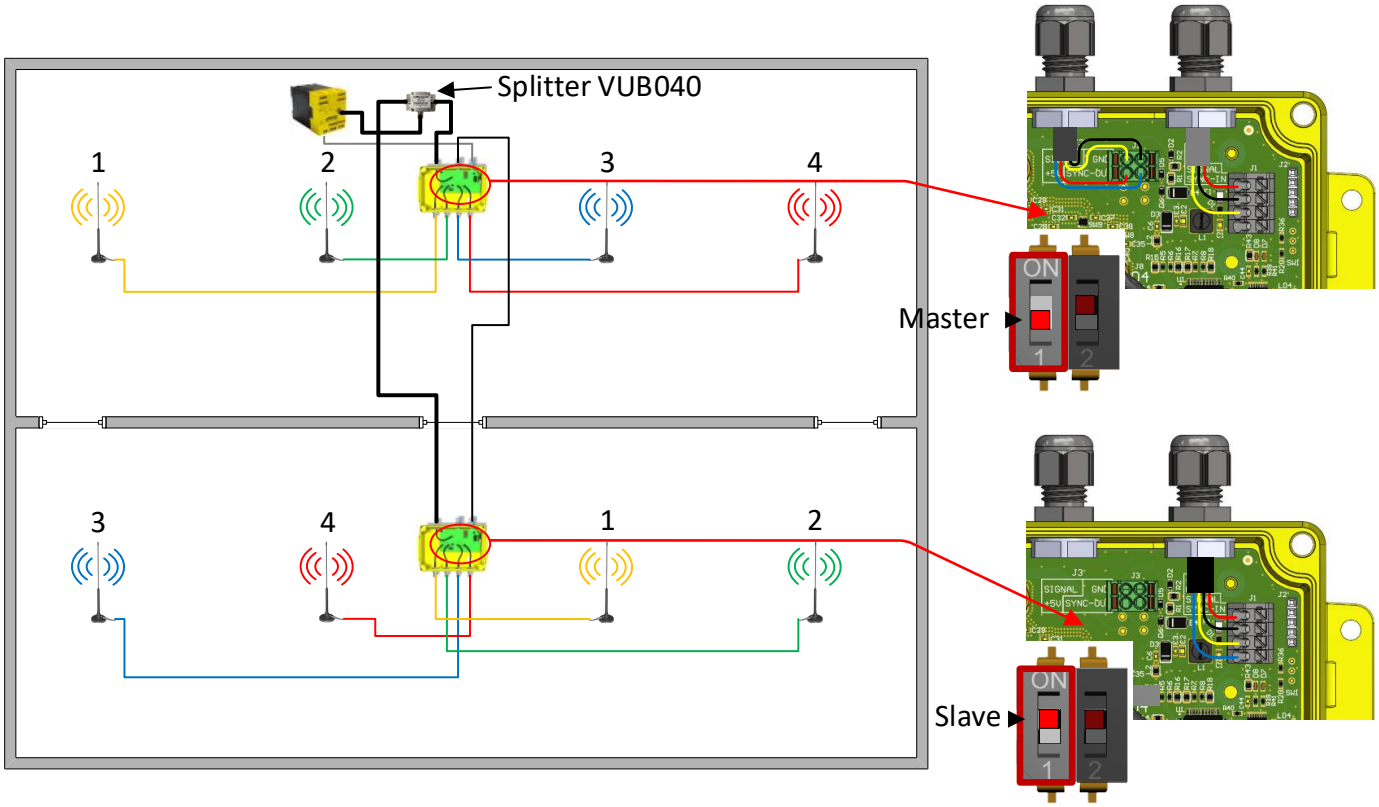
NOTE: To connect several switches to one transmitter RF output, a BNC coupler (VUB040) must be used.

To use 2 RSswitch (or more) simultaneously, it is necessary to synchronize them together. To do this, you need:

- To define **ONLY ONE** **"Master"** RSswitch and one (or more) **"Slave"** RSswitch using DIP switch N°1 on SW1:
  - DIP Switch N°1 on **OFF**: Configuration in **MASTER** mode,
  - DIP Switch N°1 on **ON**: Configuration in **SLAVE** mode.
- To put a cable link between the **"Master"** and the **"Slave"** (in case of several **"Slave"**, wire them together)
  - J2 terminal block output of the **"Master"** RSswitch must be wired on J1 terminal block input of the **"Slave"** RSswitch,
  - If another **"Slave"** RSswitch is used, connect J2 terminal block of the first **"Slave"** on J1 terminal block of the second **"Slave"**.

Once synchronized, antennas outputs of each RSswitch will switch at the same time.
To optimize even more the radio coverage, ensure to place the antennas of the different RSswitch to avoid that the nearest ones are the ones that transmit at the same time.

The following diagram shows an example of an installation implantation with 2 synchronized RSswitch to a RSEF transmitter is represented below:



6.4. JUMP repeater and RF switch (ref. VUB095)

In situations where radio performance must be extended to cover a greater distance, a greater area, a new building hall, a new warehouse aisle, or whenever heavy obstacles are met, etc, the JUMP radio repeater provides a solution to guarantee the proper transmission of a safety radio signal (initially transmitted by a JAY mono-directional product).

RSEF and RSRD are compatible with JUMP repeaters, which are also compatible with the optional RF switch (ref VUB095).

Please refer to the JUMP documentation for specific details.

6.5. Antennas for 433-434 MHz band

Antenna reference: **VUA001A (supplied by default)** Type: straight, 1/4 wave, BNC connection Approximate length: 190mm	
Antenna reference: **VUA002A** Type: straight, 1/2 wave, BNC connection Approximate length: 335mm	
Antenna references: • **VUA100AH** (with 0,5m cable), **VUA102AH** (with 2m cable), **VUA105AH** (with 5m cable), **VUA110AH** (with 10m cable) Type: through insulated remote, 1/2 wave, BNC connection Approximate length: 320mm / Required drill hole: 15mm	
Antenna references: • **VUA103AM** (with 3m cable), **VUA105AM** (with 5m cable) Type: insulated magnetic remote, tuned, BNC connection Approximate length: 440mm	
Antenna references: • **VUA103AV** (with 3m cable), **VUA105AV** (with 5m cable) Type: through uninsulated remote, 1/4 wave, BNC connection Approximate length: 180mm / Required drill hole: 12mm or 19mm	
Antenna reference: **VUA102CP (Receiver only)** Type: flat and circular, 2-m long coaxial cable with BNC connector Size: 45mm by 15mm / Required drill hole: 12mm *(for mounting on metallic structures, it is advised to add an insulating gasket between the tightening nut and the metallic structure)*	
Antenna reference: **CA435GP+-N** **ONLY FOR BE USED ON RSEF TRANSMITTER** Brand name: CompleTech Type: straight, omnidirectional ground plane, BNC connection Approximate length: 530mm (with mounting bracket)	

6.6. Antennas for 869, 911-918MHz bands

Antenna reference: **VUA001B (supplied by default)** 860-920 MHz Type: straight, 1/4 wave, BNC connection Approximate length: 90mm	
Antenna reference: **VUA002B** 820-960 MHz Type: straight, 1/2 wave, BNC connection Approximate length: 200mm	
Antenna references: 860-960 MHz • **VUA100BH** (with 0,5m cable), **VUA102BH** (with 2m cable), **VUA105BH** (with 5m cable), **VUA110BH** (with 10m cable) Type: through insulated remote, 1/2 wave, BNC connection Approximate length: 190mm / Required drill hole: 15mm	
Antenna references: 820-960 MHz • **VUA103BM** (with 3m cable), **VUA105BM** (with 5m cable) Type: insulated magnetic remote, tuned, BNC connection Approximate length: 320mm	
Antenna references: 900-920 MHz • **VUA103BV** (with 3m cable), **VUA105BV** (with 5m cable) Type: through uninsulated remote, 1/4 wave, BNC connection Approximate length: 100mm / Required drill hole: 12mm or 19mm	

6.7. Antennas for 920 MHz band

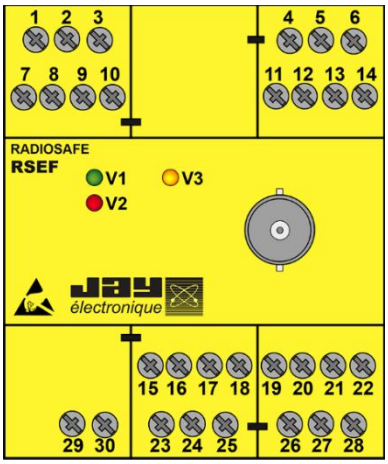
Antenna reference: **VUA001B (supplied by default)** 860-920 MHz Type: straight, 1/4 wave, BNC connection Approximate length: 90mm	
Antenna reference: **VUA002B** 820-960 MHz Type: straight, 1/2 wave, BNC connection Approximate length: 200mm	
Antenna references: 860-960 MHz • **VUA100BH** (with 0,5m cable), **VUA102BH** (with 2m cable), **VUA105BH** (with 5m cable), **VUA110BH** (with 10m cable) Type: through insulated remote, 1/2 wave, BNC connection Approximate length: 190mm / Required drill hole: 15mm	
Antenna references: 820-960 MHz • **VUA103BM** (with 3m cable), **VUA105BM** (with 5m cable) Type: insulated magnetic remote, tuned, BNC connection Approximate length: 320mm	
Antenna references: 900-920 MHz • **VUA103BV** (with 3m cable), **VUA105BV** (with 5m cable) Type: through uninsulated remote, 1/4 wave, BNC connection Approximate length: 100mm / Required drill hole: 12mm or 19mm	
Antenna references: 700-960 MHz • **VUA102BP** (with 2,5m de cable) Type: flat and circular, with BNC connexion Size: 80mm x 23mm x 10mm / Required drill hole: 17,5mm (Gain 2dBi)	

7. Troubleshooting, maintenance & warranty

7.1. Diagnosis - RSEF transmitter

Messages given by indicator lights V1 and V2

To determine possible faults, the transmitter has two indicator lights on the front panel, **V1** and **V2**.



Normal operation:

Transmitter status	V1 (green)	V2 (red)	Message indicated by indicator lights	Action
After a transmitter power up	OFF	ON for 1 second, then OFF	Transmitter initialisation phase	/
On “manual” restart mode, after a transmitter power up **OR** after the deactivation/activation of a safety input	ON	OFF	On standby for action on restart button (restart mode programmed for “manual”)	Press the restart button to place the transmitter in radio transmission mode.
After transmitter power up or when restart button is pressed (restart function in “auto” mode)	Flash	OFF	RADIO transmission	/
In radio channel configuration mode	Flashes indicate number of **units** of new radio channel	Flashes indicate number of **tens** of new radio channel	Radio channel number indication	/
	2 flashes	2 flashes	Channel inaccessible with 10mW	Change the radio channel (40 to 64).

Abnormal operation:

Transmitter status	V1 (green)	V2 (red)	V3 (orange)	Message indicated by indicator lights	Solution
After a transmitter power up	OFF	OFF	OFF	Power supply problem, transmitter not supplied	- Check the power supply voltage. - Check the protection fuse condition.
After a transmitter power up **OR** after the activation of a safety input	OFF	OFF	ON	SIM card read error	- The SIM card not present. - The SIM card is incorrectly inserted or removed from its location. - The SIM card is faulty (must be replaced).
				Incorrect wiring of safety input	Check the wiring of safety input between terminals Nb. 7 and Nb. 10.
	4 flashes	4 flashes	ON	“Input check” function has detected an error	Check the transmitter wiring: NO contacts of inputs (Nb 1 to Nb 10) and the restart button must be in “idle” position when the transmitter is powered up.
	6 flashes 5 flashes	6 flashes 5 flashes	ON	Power failure or faulty emergency stop button	- Check the supply voltage. - Check the security entrance.

7.2. RSRD receiver: Error messages

Immediately after the opening of the safety relays, the receiver Microcontroller Units (MCUs) will restart automatically.
During this process, which generally takes a couple of seconds, the full system integrity will be checked.
In some cases, an error can be reported by the receiver: it is reported 3 times (3 series of output activations, or “blinking”).
The temporary error reporting can last up to 20 seconds depending on the number of “blinking” (15s for 3 series of 5 “blinking”).
As soon as the error reporting is completed, the receiver MCUs will automatically restart.
Then, the receiver will normally be ready to operate in normal condition again: a “Start” signal will close the safety relays.

Error messages are displayed by the indicator light (LED or red colour on indicator light column) connected to 07-08/J3 terminals.

The indicator light (connected to the error output) would blink a specific number of times based on the type of temporary event to report:

Number of blinking	Message	Solution
1	Error on MCUs: Miscellaneous electronic fault	If the error persists after restarting the system, please contact our customer service.
2	Error on MCUs: RAM	Requires a factory return of the product, please contact our customer service.
3	Error on MCUs: ROM	Requires a factory return of the product, please contact our customer service.
4	Error on MCUs: Parameters	Check the configuration using dedicated software*.
5	Error on MCUs: Link with MCU no2	This error can occur after a system shutdown. If the problem persists after a reboot, please contact our customer service.
6	Error on MCUs: EEPROM	Requires a factory return of the product, please contact our customer service.
7	Error on MCUs: Low Voltage	Check the power supply.
8	Error on MCUs: Radio	Requires a factory return of the product, please contact our customer service.
9	Error on MCUs: Safety relay	This error can occur after a system shutdown. If the problem persists after a reboot, please contact our customer service.
Every second	Wired emergency stop button activated (pressed)	Unlock the emergency stop button
Fast blinks	Error detected on wired emergency stop button	Repeat a complete emergency stop cycle to clear the error. If the error occurs again, check the wiring and the emergency stop button.

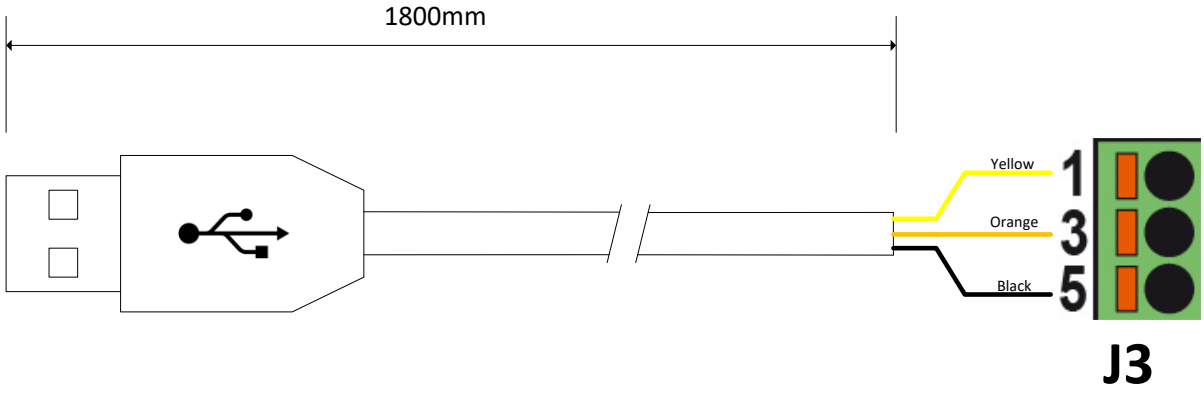
*The dedicated programming software “**DialogRSRDevice**” is available on JAY Electronique website. The use of this programming software is protected by a password, this password is only delivered to a skilled person “level 2” (a person who was trained by JAY Electronique, and who is authorized to modify RSRD receiver parameters).

7.3. Connect the RSRD to a PC

The link between a PC and a RSRD receiver is made via a serial COM port RS232. You can connect directly the COM port to RSRD or use a RSW39 tool.

The RSW39 tool is a USB to RS232 Serial Converter. This cable requires USB drivers (available free of charge from JAY Electronique or from http://www.ftdichip.com). The drivers are used to create a virtual COM port (VCP). This allows the user to communicate with the USB interface via a standard PC serial emulation port.

The serial emulation port created can be configured in the dedicated software "**DialogRSRDevice**" (separate documentation).



7.4. Servicing

IMPORTANT: Make sure transmitter and receiver power supplies are switched off before you perform any servicing operation.

- The components can only be disassembled by a trained technician in a “controlled” environment; parts must only be replaced by genuine identical spare parts.
- Use only soap-based solutions when cleaning housings; do not use any aggressive cleaning products.

7.5. Replacement of RSEF transmitter

Without unwiring the product, proceed as detailed below:

- **Step 1:** Switch off the power supply.
- **Step 2:** Remove the front panel from the product. (Fig.1)
- **Step 3:** **Transmitter RSEF:** If the SIM card of the new transmitter does not contain the same information as the SIM card of the defective product, remove the SIM card and install it in the new product. (Fig.2)
- **Step 4:** Disconnect the removable terminals by applying a turning action using a flat tip screwdriver (Fig.3)
- **Step 5:** Re-program the new product identically to the old product. (Fig.4)
  - ➢ DIP-switches set identically for both transmitters.
- **Step 6:** Connect the removable terminals on the new product. (Fig.5)
- **Step 7:** Connect and supply the new product. Then, proceed with tests.

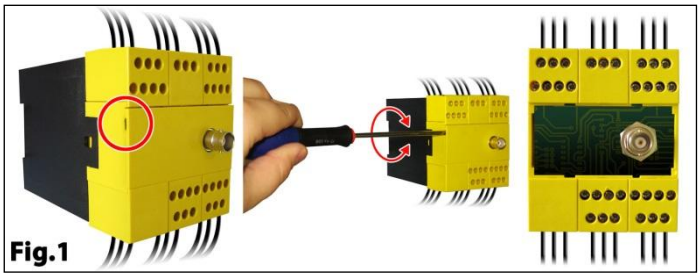


Fig.1

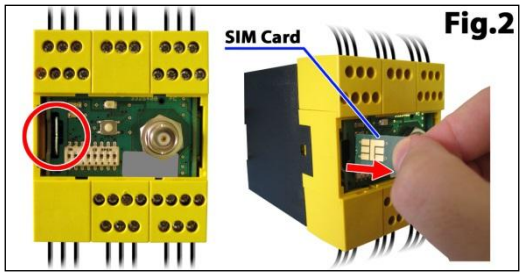


Fig.2

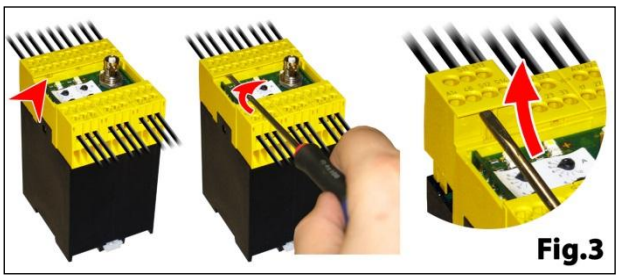


Fig.3

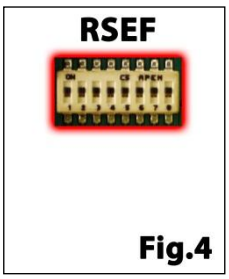


Fig.4

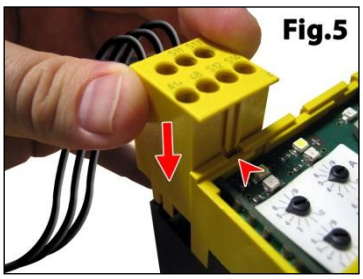


Fig.5

7.6. Inspection and servicing of the receiver RSRD

The receiver can be dismantled only by a trained staff, in a "controlled" environment. Spare parts can be changed only by identical and original parts.

Visual inspection should be done during the regular maintenance interval of the machine:

- Check the antenna connection and check that it is clean and free of any oxidation,
- Check the wiring of the receiver on the electrical unit, on the power supply and on the machine and the wiring of the functional outputs,
- Check the correct operation of both active and passive stop circuits,
- Once by year, it is necessary to check the Emergency Stop function and (Emergency Stop button(s) and safety relays).

7.7. Warranty

All our products are guaranteed two years as of date of shipment. Any repairs, changes or replacement of a product during the warranty period shall not result in extension of the warranty period.

Limit:

The warranty does not cover defects resulting from:

- Transportation,
- False manoeuvres or failure to observe the wiring diagrams when installing and commissioning,
- Or insufficient monitoring or servicing, or any use not compliant with the specifications detailed in this technical manual and, as a general rule, any storage conditions, operating or environment conditions (atmospheric, chemical, electrical, mechanical or other) which are inappropriate or not covered by the order.

This warranty shall not apply where any modifications, disassembly or additions have been made by the customer without the written authorisation of JAY Electronique.

The responsibility of the JAY Electronique company during the warranty period is limited to material and construction defects; the warranty covers repair of the product in the JAY Electronique shops or free replacement of parts recognised to be faulty following expert investigation by the JAY Electronique “technical services”. The warranty does not give right to any compensation for damages.

For any dispute relative to a supply or settlement thereof, the TRADE TRIBUNAL OF GRENOBLE shall be solely competent, even where an Appeal may be requested or where a plurality of defendants may exist.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

8. Applicable standards and regulations

8.1. FCC Rules & Regulations (Federal Communications Commission)

OEM integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module.

Any changes or modifications to this equipment not expressly approved by **JAY Electronique** may cause, harmful interference and void the FCC authorization to operate this equipment.

This equipment complies with FCC's radiation exposure limits set forth for an uncontrolled environment under the following conditions:

1. This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) and user's/nearby person's body at all times.
2. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Authorized antennas:
see section 6.4 « Antennas for 911-918 MHz band »

Antenna installation requirements:
see section 5.4 « Positioning the components and antennas »

For class B Equipment:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help

Warning:
Those devices must be professionally installed.

8.2. IC Regulations (Industry Canada)

The OEM integrators are responsible for ensuring that the end-user has no manual instructions to remove or install module.

This equipment complies with RSS102's radiation exposure limits set forth for an uncontrolled environment under the following conditions:

1. This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) and user's/nearby person's body at all times.
2. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This radio transmitter (IC: 3393A-RSEF) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Authorized antennas:
see section 6.4 « Antennas for 911-918 MHz band »

Antenna installation requirements:
see section 5.4 « Positioning the components and antennas »

This device contains licence-exempt receiver that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

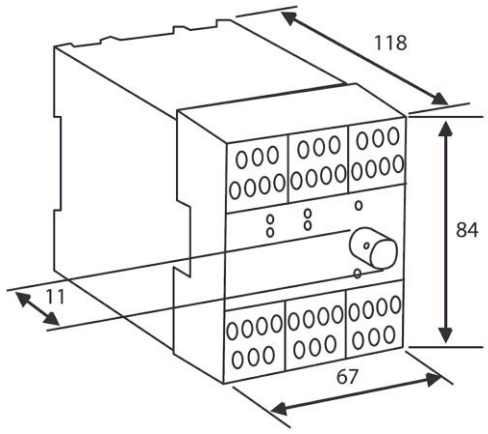
1. L'appareil ne doit pas produire de brouillage. ;

L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

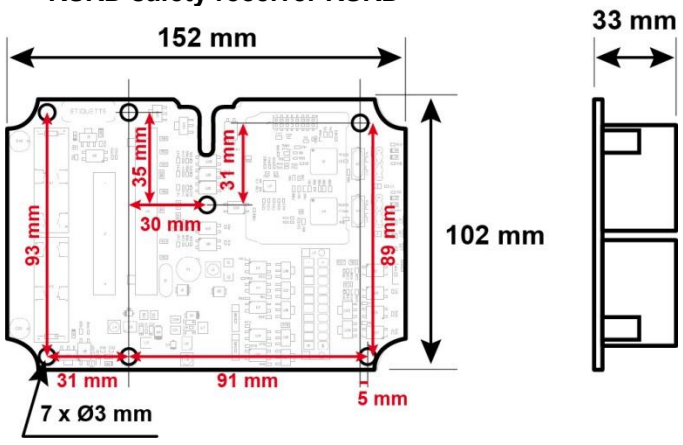
9. Appendices

9.1. Component dimensions (mm)

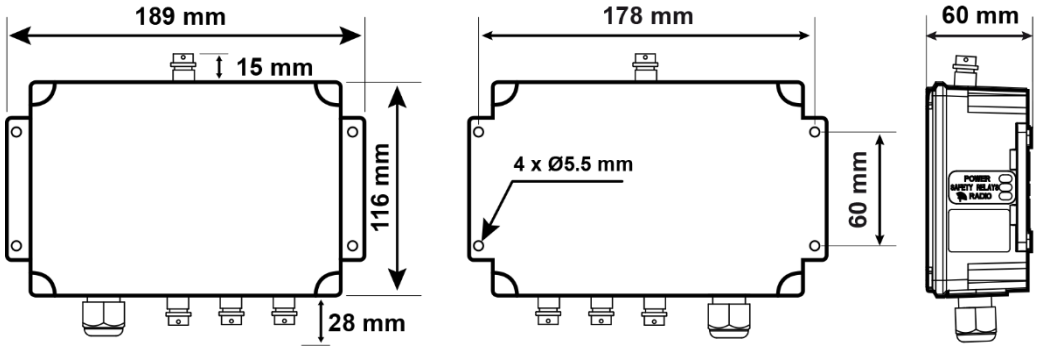
- **RSEF safety transmitter**



- **RSRD safety receiver RSRD**



- **RSswitch and RF switch (ref. VUB090 and VUB095)**



9.2. Technical characteristics

9.2.1. Transmitter RSEF

Mechanical and environment withstand characteristics
Housing material: Plastic
Ingress protection: IP 40 **IMPORTANT:** transmitter RSEF must be mounted in a housing with protection degree IP54 min.
Weight: 500 g
Operating temperature range: -20 °C to + 50 °C
Storage temperature range: - 30 °C to + 70 °C
Connection: Terminal strips (plug-in), screw-type for wires 0.08 mm² to 2.5 mm²
Antenna: Depending on frequency
Radio characteristics
Radio transmission frequencies: **RSEF40:** 64 frequencies, from 433.100 MHz to 434.675 MHz — **RSEF41/4P:** 25 frequencies, from 434.100 to 434.675 MHz **RSEF9:** 64 frequencies, from 911.800 to 918.20 MHz — **RSEFJ:** 31 frequencies from 920.600 to 929.650 MHz
Transmit power: RSEF40: 1mW — RSEF91: 0.5mW — RSEFJ (channels 1 to 15): 20mW RSEF41: 10mW — RSEF9P: 0.5mW — RSEFJ (channels 16 to 31): 1mW RSEF4P: 10mW
Average range in typical industrial environment [1]: RSEF40: 150m — RSEF91: 40m — RSEFJ (20mW channels 1 to 15): 200m RSEF41: 250m — RSEF9P: 40m — RSEFJ (1mW channels 16 to 31): 50m RSEF4P: 250m
Electrical and functional characteristics
Power supply voltage: 24 VDC SELV/PELV +/- 20% In accordance with chapter 9.4 of IEC / UL 61010-1 3rd edition, the product must be powered by class 2 power supply or by limited energy
Max. consumption: 100 mA (non-loaded static outputs and without any activated input) **Max. consumption protected by fuse:** 500 mA
Number of inputs: 13 ■ 2 safety inputs (for emergency stop, safety light curtain, etc.) ■ 10 function inputs ■ 1 « restart button » input
Low level on input: dc voltage < 2 V
High level on input: dc voltage > 3 V
Maximum voltage on an input with no damage: 30 V
Consumption of an input active at high level: < 20 mA
Maximum frequency of a signal on an input: 10 Hz max
Static outputs (not suitable for application requiring a safety level): **Number and type of outputs:** 2 PNP outputs (Images of indicator lights V1 and V2) **Output voltage :** 24 VDC, 100 mA max.
Indication: 3 indicator lights

[1] Range varies according to environment conditions of transmitter and of receiver antenna (frameworks, metal partitions, etc.).

9.2.2. Receiver RSRD

Mechanical and environment withstand characteristics

Housing material: Polyamide 6/6 (PA6/6), glass bead filled

Ingress protection: IP 65

Weight: 700 g (complete model with housing)

Operating temperature range: - 20 °C to + 60 °C

Storage temperature range: - 30 °C to + 70 °C

Connection: Spring – type plug in connectors
Minimum Cable rated voltage of 250 VAC
Conductor wire sections to be observed on T-blocks:
J1 & J2..... 0,2 mm² to 2,5 mm²
J3 ..... 0,25 mm² to 1,5 mm²

Antenna: Depending on frequency

Cable lead-out:
- M16 cable gland for safety relays (tightening torque to be respected = 2N.m)
- M25 cable gland for power supply and other signals (tightening torque to be respected = 5N.m)

Electrical characteristics

Power supply voltage: 24 VDC SELV/PELV +/- 20%
In accordance with chapter 9.4 of IEC / UL 61010-1 3rd edition, the product must be powered by class 2 power supply or by limited energy

Max. consumption: 120 mA (non-loaded static outputs)
Max. consumption protected by fuse: 500mA

Safety relay outputs:

Contacts: 3 NO forcibly guided contacts

Tripping time (reaction):
- Local emergency stop reaction time: 60ms
- Active stop time following activation of transmitter RSEF safety input: 55ms + Safety Delay
- Enabling switch reaction time: 30ms
- Passive stop time (1):
  - 30ms, for emergency stop according to EN 60204-1:2018
    to
  - 2s, for a safety stop according EN 60204-32:2008 §9.2.7, If the requirement of the risk analysis allows it
- Safety Delay (1): 0 to 10s set by step of 1s (default 0s)

Max. switching capacity:

US/Canada specification according to UL 60947-4-1A	3.6A 30VAC 3.6A 30VDC	Resistive load	SAT 85 °C	70.000 cycles 100.000 cycles
	2A 30VAC	Pilot Duty load	T. ambient 25 °C	10.000 cycles
	1.5A 30VAC	Pilot Duty load	T. ambient 60 °C	
VDE	3.6A 250VAC 3.6A 30VDC Per AC15: 2A / 240V for 1 NO contact loaded EN 60947-5-1 Per AC15: 1.5A / 240V for all contacts loaded EN 60947-5-1			50.000 cycles 50.000 cycles

Static outputs (not secure): **Number and type of outputs:** 4 PNP outputs
Output voltage : 24VDC, 100mA max.

Indication: 3 indicator lights 24VDC, 100mA max

Input characteristics:

- **Isolated "Configuration" Input:**
  Low level on input: dc voltage < 4.6 V Receiving mode
  High level on input: dc voltage > 9.2 V Programming mode
  Consumption: resistive load 3KΩ (depending on voltage -> I_{IN} (mA) = V_{IN} / 3)
- **Other input: Dry Contact – potential free contact**
  R_{ONmax} (On resistance value) = 10Ω
  Consumption: 10 mA per input active.

*(1) The passive stop time and the safety delay can be set with dedicated software**
* The dedicated programming software is available on JAY Electronique website. The use of the programming software is protected by a password, this password is only delivered to a skilled person "level 2" (a person who was trained by JAY Electronique, and who is authorized to modify RSRD receiver parameters).

9.2.3. RSswitch

Mechanical and environment withstand characteristics

Housing material: Polyamide 6/6 (PA6/6),

Ingress protection: IP65

Weight: 700 g (full model with housing)

Operating temperature range: - 20 °C to + 60 °C

Storage temperature range: - 30 °C to + 70 °C

Connection:

- 5 BNC connectors for the Radio Frequency part
- 2 cables lead-out with cable glands for power supply and command signals

Electrical characteristics

Power supply voltage: 5V VDC (provided by RSEF)
Consumption: 10mA max

Input caracteristic:

- TTL input high threshold: 2V min.
- TTL input low threshold: 0.8V Max

Typical RF performance: (Valid data for all frequency bands)

- Insertion loss: 2dB
- Isolation: (dB)

434MHz				915MHz			
O1	O2	O3	O4	O1	O2	O3	O4
X	83,4	92,4	94,4	X	67,6	77,6	93,6
80,4	X	86,4	95,4	77,6	X	74,6	77,6
88,2	83,2	X	76,2	82,4	78,4	X	77,4
91,2	84,2	75,2	X	83,4	83,4	74,4	X

Switching time: 10µs Max

9.2.4. VUB090 Augmented connectivity module (RF splitter)

Mechanical and environment withstand characteristics
Housing material: Polyamide 6/6 (PA6/6)
Protection index: IP 65 (Outdoor use dry location have to be protected of weather, U.V. and frost.) Pollution degree: 2
Weight: 700 g (complete model with housing)
Operating temperature range: - 20 °C to + 60 °C
Storage temperature range: - 30 °C to + 70 °C
Connection: ■ 3 BNC connector for the Radio Frequency I/O ■ 1 cable for the power supply and signals
Electrical characteristics
supply voltage: 5VDC provided by RSEF **current supply**: 10mA max
Input characteristics: ■ TTL INPUT HIGH THRESHOLD: 2V min ■ TTL INPUT LOW THRESHOLD: 0.8V max **Typical Performance RF Data for all frequency band:** ■ INSERTION LOSS: 1dB ■ ISOLATION: 40dB **SWITCHING TIME:** 4.0µs max

9.3. Environmental data

Mechanical: Products fulfil the vibration and shock standards vibrations EN 60068-2-6:2008 and EN 60068-2-27:2009:

- EN 60068.2.6:2008, test FC, 0.7mm peak to peak from 10 to 57Hz 5g from 57 to 150Hz.
- Mechanical shock: EN 60068.2.27:2009, test Ea. 30g/11ms
- Mechanical bump test: EN 60068.2.27:2009, test Ea, 10g/16ms

The maximum relative humidity is 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C.

The maximum height of use is 2000m max above the sea level.

The RSRD receiver has a lifetime of 20 years.

9.4. Safety related parameters

The products have been designed and tested in compliance with the principles described in standards EN ISO 13849-1, EN IEC 62061 and IEC 61508. Detailed reports are kept in the laboratory's files.

Functional tests, hardware and software failure tests and a detailed source code review were performed.

List of standards: see the document « Declaration of conformity » of the product.

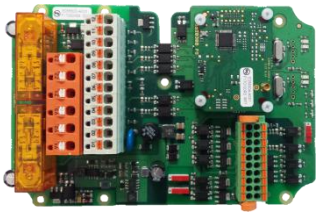
EN ISO 13849-1:2015 for performance level PL e (Category 4) and IEC 61508:2010 and EN IEC 62061:2021 for SIL 3 emergency stop function.

9.4.1. Characteristic data according to IEC 61508 and EN IEC 62061

The calculation of these values is based on the following assumptions:

- Number of operating days per year: dop = 365d
- Number of operating hours per day: hop = 24h
- Operating frequency: 1/h

Product	Parameters	Results
Transmitter RSEF 	Safety integrity level	SIL 3
	PFH[1/h]	1.6E-09
	Proof Test Interval T1	20 years

Product	Parameters	Results
Receiver RSRD 	Safety integrity level	SIL 3
	PFH[1/h]	1.04E-09
	SFF	99.42%
	Proof Test Interval T1	20 years
	Type	B
	Safe state	Open of at least one of both safety relays

Another calculation case with the following assumptions:

- Number of operating days per year: dop = 365d
- Number of operating hours per day: hop = 24h
- Operating frequency: 600/h

Product	Parameters	Results
Receiver RSRD 	Safety integrity level	SIL 3
	PFH	7.97E-08
	SFF	99.42%
	Proof Test Interval T1	20 years
	Type	B
	Safe state	Open of at least one of both safety relays

9.4.2. Characteristic data according to EN ISO 13849-1

The calculation of these values is based on the following assumptions:

- Number of operating days per year: dop = 365d
- Number of operating hours per day: hop = 24h
- Operating frequency: 1/h

Product	Parameters	Results
Transmitter RSEF 	Performance level	PL e
	Category	4
	MTTFD	186 years
	Diagnostic Coverage DC	98%

Product	Parameters	Results
Receiver RSRD 	Performance level	PL e
	Category	4
	MTTFD	838.32 years
	Diagnostic Coverage DC	99%
	CCF	80%

Another calculation case with the following assumptions:

- Number of operating days per year: dop = 365d
- Number of operating hours per day: hop = 24h
- Operating frequency: 600/h

Product	Parameters	Results
Receiver RSRD 	Performance level	PL e
	Category	4
	MTTFD	155.28 years
	Diagnostic Coverage DC	99%
	CCF	80%

9.5. RSEF transmitter case thermal capability

The power supply plus any input or output with a 24VDC power supply represents a maximum power of:
Pmax = 18W.

9.6. Miscellaneous

9.6.1. Residual risks

The product being an element of the equipment, a risk analysis of the concerned application will allow to estimate these residual risks.

9.6.2. Forseeable misuse

Polarity inversions of the safety transmitter or safety receiver power supply: *Product do not start.*

Other misuse of the RSEF safety transmitter: *See troubleshooting guidelines in Section 7.1.*

Other misuse of the RSRD safety receiver: *See troubleshooting guidelines in Section 7.2.*

9.6.3. Waste recycling and management

When the unit has reached the end of its service life, be sure to dispose of it appropriately. The unit can be disposed of in a specific waste collection centre as organised by the local authorities, or it can be turned over to a distributor who will handle proper disposal of the unit.

Electronic waste sorting will prevent possible negative impact on the environment resulting from inappropriate elimination of electronic waste and will allow proper processing and recycling of the materials forming the unit, representing significant savings in terms of energy and resources.

9.6.4. Products references

See the products sales documentation.

9.6.5. Warning, avoid any mutual disturbance

Be certain that the wireless system does not disturb other systems and that it is not being disturbed itself by other Systems. Use different codes and different frequencies.

9.6.6. Countries limitation of the use

See ERC/REC 70-03 for eventual limitation of the use of Annex 1 Band F1 (Non-specific SRDs) 433.050-434.790 MHz (6 October 2010 edition Russian Federation Not implemented).

9.6.7. Manufacturer information

Manufacturer and plant:
JAY Electronique
ZAC la Bâtie, 37 rue Champrond
F38334 SAINT-ISMIER cedex

Tel: +33 (0)4 76 41 44 00
www.jay-electronique.com

10. Declarations of conformity

DECLARATION UE DE CONFORMITE
ORIGINAL

FR

Le fabricant :

JAY électronique
ZAC la Bâtie, rue Champrond
38334 ST ISMIER Cedex
FRANCE

Déclare que pour l'émetteur suivant :

Série RS
RSEFxx-x
& RSDxBxxxxxxxx-1

Est en conformité aux exigences des directives suivantes et que cette conformité a été vérifiée selon les normes suivantes :

Directives	Normes Harmonisées & Autres normes
DIRECTIVE 2006/42/CE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 17 mai 2006 relative aux machines et modifiant la directive 95/16/CE	*EN ISO 13849-1 :2015 Exigences pour le niveau de performance PL e (Catégorie 4)* *EN 61508-1-7 :2010 Exigences pour le SIL 3* *EN 62061 :2021 Exigences pour le SIL 3* *UL 1998 :2013* *EN 60204-1 :2018* *EN 60204-32 :2008*
Déclaration individuelle de conformité Preuve de conformité	La fonction d'arrêt d'urgence sans fil (arrêt de catégorie 0 ou catégorie 1), la function d'arrêt d'urgence filaire (arrêt catégorie 0) et la poignée de validation (arrêt de catégorie 0) du RSRD peuvent être utilisé dans des applications jusqu'à la Catégorie 4 (PL e) selon EN ISO 13849-1 :2015 et SIL 3 selon l'EN IEC 62061 :2021 et l'EN 61508-1-7 :2010. L'organisme notifié n°0123 : ***TÜV SÜD Product Service GmbH*** ***Ridlerstaße 65*** ***D-80339 München*** ***Germany*** A délivré un examen CE de type n° **M6A 035304 0009 Rev01** sur la base de la conformité aux normes.
DIRECTIVE 2014/35/UE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 26 février 2014 relative à l'harmonisation des législations des États membres concernant la mise à disposition sur le marché du matériel électrique destiné à être employé dans certaines limites de tension	*IEC 61010-1 :2010* *EN 62479 :2010* *EN 60204-1 :2018* *EN 60204-32 :2008* *NFPA 79 :2018*
DIRECTIVE 2014/30/UE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 26 février 2014 relative à l'harmonisation des législations des États membres concernant la compatibilité électromagnétique (refonte)	*EN IEC 62061 :2021* *EN 301 489,3 V2.1.1* *EN 301 489-1 V2.2.3* *EN IEC 61000-6-2 :2019* *EN 61000-6-7 :2015* *EN 61326-3-1:2017* *EN IEC 61326-1:2021*
DIRECTIVE 2014/53/UE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 16 avril 2014 relative à l'harmonisation des législations des États membres concernant la mise à disposition sur le marché d'équipements radioélectriques et abrogeant la directive 1999/5/CE	*EN 300 220-2 V3.1.1* • *frequency Band 433.05-434.79 MHz*
DIRECTIVE 2011/65/UE DU PARLEMENT EUROPEEN ET DU CONSEIL du 8 juin 2011, relative à la limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques (RoHS)	
DIRECTIVE 2012/19/UE DU PARLEMENT EUROPEEN ET DU CONSEIL du 4 juillet 2012, relative aux déchets d'équipements électriques et électroniques (DEEE)	

Il est important que le produit soit soumis à une installation, une maintenance et une utilisation correctes conformément à sa destination, aux réglementations et normes applicables, aux instructions du fournisseur, au manuel d'utilisation et aux règles de l'art reconnues.

Nom, Fonction et adresse de la personne autorisée à constituer le dossier technique (2006/42 annexe II §2),
Laurent Damon, Responsable Technique - JAY électronique ZAC la Bâtie, rue Champrond 38334 St Ismier-France

Fait à : Saint Ismier, FRANCE, 25/10/2023.

Signature:

354740B

Translated from French

EN

DECLARATION EU OF CONFORMITY

The manufacturer

JAY Electronique
ZAC la Bâtie, rue Champrond
38334 ST ISMIER Cedex
FRANCE

Declares that for the following transmitter set:

RS Series
RSEFxx-x
& RSDxBxxxxxxxx-1

is in conformity with the requirements of the following directives and conformity was checked in accordance with the following standards:

Directives	Harmonised Standards & Other standards
DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC	*EN ISO 13849-1 :2015 Requirements for performance level PL e (Category 4)* *EN 61508-1-7 :2010 Requirements for SIL 3* *EN 62061 :2021 Requirements for SIL 3* *UL 1998 :2013* *EN 60204-1 :2018* *EN 60204-32 :2008*
Individual declaration of conformity	The wireless safety stop (stop category 0 or 1), the local emergency stop (stop category 0) and enabling switch function (stop category 0) of RSRD equipment can be used in applications up to Category 4 (PLe) according to EN ISO 13849-1 :2015 and SIL 3 according to EN IEC 62061 :2021 and EN 61508-1-7 :2010.
Conformity evidence	The notified body No. 0123: ***TÜV SÜD Porduct Service GmbH*** ***Ridmerstraße 65*** ***D-80339 München*** ***Germany*** Has issued an EC-Type examination n° **M6A 035304 0009 Rev01** reflecting compliance with the standards.
DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits	*IEC 61010-1 :2010* *EN 62479 :2010* *EN 60204-1 :2018* *EN 60204-32 :2008* *NFPA 79 :2018*
DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)	*EN IEC 62061 :2021* *EN 301 489,3 V2.1.1* *EN 301 489-1 V2.2.3* *EN IEC 61000-6-2 :2019* *EN 61000-6-7 :2015* *EN 61326-3-1:2017* *EN IEC 61326-1:2021*
DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC	*EN 300 220-2 V3.1.1* • *frequency Band 433.05-434.79 MHz*
DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 related to the limitation of use of certain dangerous substances in electrical and electronic equipment (RoHS)	
DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 related to electrical and electronic equipment waste (WEEE)	

It is important that the component is subject to correct installation, maintenance and use conforming to its intended purpose, to the applicable regulations and standards, to the supplier's instructions, user manual and to the accepted rules of the art.

Name, function and address of the person authorised to compile the technical file:
Laurent Damon, Technical Manager - JAY électronique ZAC la Bâtie, rue Champrond 38334 St Ismier-France

Issued at: Saint Ismier, FRANCE, 2023/10/25.

Signature: *signed on original*

354740B

DECLARATION UE DE CONFORMITE
ORIGINAL

FR

Le fabricant :

JAY électronique
ZAC la Bâtie, rue Champrond
38334 ST ISMIER Cedex
FRANCE

Déclare que pour le récepteur suivant :

Série RS
RSRDxxxx-x

Est en conformité aux exigences des directives suivantes et que cette conformité a été vérifiée selon les normes suivantes :

Directives	Normes Harmonisées & Autres normes
DIRECTIVE 2006/42/CE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 17 mai 2006 relative aux machines et modifiant la directive 95/16/CE	*EN ISO 13849-1 :2015 Exigences pour le niveau de performance PL e (Catégorie 4)* *EN 61508-1-7 :2010 Exigences pour le SIL 3* *EN IEC 62061 :2021 Exigences pour le SIL 3* *UL 1998 :2013* *IEC 60204-1 :2016* *EN 60204-32 :2008*
Déclaration individuelle de conformité Preuve de conformité	La fonction d'arrêt d'urgence sans fil (arrêt de catégorie 0 ou catégorie 1), la function d'arrêt d'urgence filaire (arrêt catégorie 0) et la poignée de validation (arrêt de catégorie 0) du RSRD peuvent être utilisé dans des applications jusqu'à la Catégorie 4 (PL e) selon EN ISO 13849-1 :2015 et SIL 3 selon l'EN IEC 62061 :2021 et l'EN 61508-1-7 :2010. L'organisme notifié n°0123 : ***TÜV SÜD Rail GmbH*** ***Ridlerstraße 65*** ***D-80339 München*** ***Germany*** A délivré un examen CE de type n° **M6A 035304 0009 Rev01** sur la base de la conformité aux normes.
DIRECTIVE 2014/35/UE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 26 février 2014 relative à l'harmonisation des législations des États membres concernant la mise à disposition sur le marché du matériel électrique destiné à être employé dans certaines limites de tension	*IEC 61010-1 :2010* *EN 62479 :2010* *IEC 60204-1 :2016* *EN 60204-32 :2008* *NFPA 79 :2018*
DIRECTIVE 2014/30/UE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 26 février 2014 relative à l'harmonisation des législations des États membres concernant la compatibilité électromagnétique (refonte)	*EN 301 489,3 V2.1.1* *EN 301 489-1 V2.2.3* *EN IEC 61000-6-2 :2019* *EN 61000-6-7 :2015* *EN 62061 : 2005/AC : 2010/A1: 2013/A2:2015* *EN 61326-3-1:2017* *EN 61326-1:2013*
DIRECTIVE 2014/53/UE DU PARLEMENT EUROPÉEN ET DU CONSEIL du 16 avril 2014 relative à l'harmonisation des législations des États membres concernant la mise à disposition sur le marché d'équipements radioélectriques et abrogeant la directive 1999/5/CE	*EN 300 220-2 V3.1.1* • *frequency Band 433.05-434.79 MHz*
DIRECTIVE 2011/65/UE DU PARLEMENT EUROPEEN ET DU CONSEIL du 8 juin 2011, relative à la limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques (RoHS)	
DIRECTIVE 2012/19/UE DU PARLEMENT EUROPEEN ET DU CONSEIL du 4 juillet 2012, relative aux déchets d'équipements électriques et électroniques (DEEE)	

Il est important que le produit soit soumis à une installation, une maintenance et une utilisation correctes conformément à sa destination, aux réglementations et normes applicables, aux instructions du fournisseur, au manuel d'utilisation et aux règles de l'art reconnues.

Nom, Fonction et adresse de la personne autorisée à constituer le dossier technique (2006/42 annexe II §2),
Laurent Damon, Responsable Technique - JAY électronique ZAC la Bâtie, rue Champrond 38334 St Ismier-France

Fait à : Saint Ismier, FRANCE, 26/10/2023.

Signature:

331190D

Translated from French

EN

DECLARATION EU OF CONFORMITY

The manufacturer

JAY Electronique
ZAC la Bâtie, rue Champrond
38334 ST ISMIER Cedex
FRANCE

Declares that for the following receiver set :

RS Series
RSRDxxxx-x

is in conformity with the requirements of the following directives and conformity was checked in accordance with the following standards:

Directives	Harmonised Standards & Other standards
DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC	*EN ISO 13849-1 :2015 Requirements for performance level PL e (Category 4)* *EN 61508-1-7 :2010 Requirements for SIL 3* *EN IEC 62061 :2021 Requirements for SIL 3* *UL 1998 :2013* *IEC 60204-1 :2016* *EN 60204-32 :2008*
Individual declaration of conformity Conformity evidence	The wireless safety stop (stop category 0 or 1), the local emergency stop (stop category 0) and enabling switch function (stop category 0) of RSRD equipment can be used in applications up to Category 4 (PLe) according to EN ISO 13849-1 :2015 and SIL 3 according to EN IEC 62061 :2021 and EN 61508-1-7 :2010. The notified body No. 0123: ***TÜV SÜD Rail GmbH*** ***Ridlerstraße 65*** ***D-80339 München*** ***Germany*** Has issued an EC-Type examination n° **M6A 035304 0009 Rev01** reflecting compliance with the standards.
DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits	*IEC 61010-1 :2010* *EN 62479 :2010* *IEC 60204-1 :2016* *EN 60204-32 :2008* *NFPA 79 :2018*
DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)	*EN 301 489,3 V2.1.1* *EN 301 489-1 V2.2.3* *EN IEC 61000-6-2 :2019* *EN 61000-6-7 :2015* *EN 62061 : 2005/AC : 2010/A1 : 2013/ A2:2015* *EN 61326-3-1:2017* *EN 61326-1:2013*
DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC	*EN 300 220-2 V3.1.1* • *frequency Band 433.05-434.79 MHz*
DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 related to the limitation of use of certain dangerous substances in electrical and electronic equipment (RoHS)	
DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 related to electrical and electronic equipment waste (WEEE)	

It is important that the component is subject to correct installation, maintenance and use conforming to its intended purpose, to the applicable regulations and standards, to the supplier's instructions, user manual and to the accepted rules of the art.

Name, function and address of the person authorised to compile the technical file:
Laurent Damon, Technical Manager - JAY électronique ZAC la Bâtie, rue Champrond 38334 St Ismier-France

Issued at: Saint Ismier, FRANCE, 2023/10/26.

Signature: *signed on original*

331190D

EMITECH GROUPE

RR051-16-107296-1A Ed. 0

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
TRANSMITTER RSEF

FCC ID: OQMRSEF

Company:
JAY ELECTRONIQUE

DISTRIBUTION: Mr VANREMOORTERE **(Company:** JAY ELECTRONIQUE)

Number of pages: 51 with 6 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	09-MAR-2017	Creation	T. LEDRESSEUR Radio Technician	

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This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

RR051-16-107296-2-A Ed. 0

Certification Radio test report

According to the standards:
RSS GEN – Issue 4
RSS 210 - Issue 9

Equipment under test:
TRANSMITTER RSEF

IC NUMBER: 3393A-RSEF

Company:
JAY ELECTRONIQUE

DISTRIBUTION: Mr VANREMOORTERE **(Company:** JAY ELECTRONIQUE)

Number of pages: 49 with 6 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	09-MAR-2017	Creation	T. LEDRESSEUR Radio Technician	

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RR051-16-107296-3-A Ed. 0

Verification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
RECEIVER RSRD

Company:
JAY ELECTRONIQUE

DISTRIBUTION: Mr VANREMOORTERE **(Company:** JAY ELECTRONIQUE)

Number of pages: 22 with 3 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	09-MAR-2017	Creation	T. LEDRESSEUR Radio Technician	DUMESNIL M.

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RR051-16-107296-4-A Ed. 0

Verification Radio test report

According to the standard:
ICES 003 – Issue 6
RSS GEN – Issue 4

Equipment under test:
RECEIVER RSRD

Company:
JAY ELECTRONIQUE

DISTRIBUTION: Mr VANREMOORTERE **(Company:** JAY ELECTRONIQUE)

Number of pages: 21 with 3 appendixes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	09-MAR-2017	Creation	T. LEDRESSEUR Radio Technician	DUMESNIL M.

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This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

工事設計認証書

社名　JAY Electronique
代表者　Patrick Berthet　殿

認証番号	018-210091
認証を受けた者の氏名又は名称 住所	JAY Electronique ZAC la Bâtie, rue Champrond 38334 Saint Ismier, FRANCE
特定無線設備の種別	第2条第1項第8号に掲げる無線設備
特定無線設備の型式又は名称	RSEF(transmitter)/RSRD(receiver)
電波の型式、 周波数及び空中線電力	F1D　928.15～929.65MHz(100kHz間隔16波）1.0mW
認証をした年月日	2021-04-20
備考	

上記のとおり、電波法第38条の24第1項の規定に基づく工事設計について認証を行ったことを証する。

発行：2021-04-20

C&S
株式会社　認証技術支援センター

工事設計認証書

社名　JAY Electronique
代表者　Patrick Berthet　殿

認証番号	018-210092
認証を受けた者の氏名又は名称 住所	JAY Electronique ZAC la Bâtie, rue Champrond 38334 Saint Ismier, FRANCE
特定無線設備の種別	第2条第1項第8号に掲げる無線設備
特定無線設備の型式又は名称	RSEF(transmitter)/RSRD(receiver)
電波の型式、 周波数及び空中線電力	F1D　920.6～923.4MHz(200kHz間隔15波)　20.0mW
認証をした年月日	2021-04-20
備考	

上記のとおり、電波法第38条の24第1項の規定に基づく工事設計について認証を行ったことを証する。

発行：2021-04-20

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