RADIOSAFE (RS) series

Wireless safety logic signal transmission system



Installation and user manual

- ORIGINAL VERSION -



TABLE OF CONTENTS

1	Sa	fety rules and general precautions	4
2	lde	ntification of components :	4
3	Pro	oduct operating principle	5
4	Ch 4.1 4.2	eck of functions, initial startup Parameters on delivery « ex-FACTORY » Installing the SIM card before startup of transmitter RSEF	6 6
	4.3 4.3.1 4.3.2 4.3.3	Preliminary steps before installation	7 7 8 9
5	Мо	difying the configuration of the transmitter RSEF	10
	5.1	Configuring the radio transmit frequency	11
	5.2	Configuring the check function for inputs E1 to E10 on power up	12
	5.3	Configuring the restart mode of transmitter RSEF	13
6	Мо	difying the configuration of the receiver RSRA	14
	6.1	Selecting the application program ("B" selectors)	14
	6.2	Safety input nb.2 : Selecting the muting time ("A" selectors)	15
7	Wi	ring the components	16
	7.1	Wiring the transmitter RSEF:	16
	7.2	Wiring the receiver RSRA :	17
	7.2. 1 7.2.2 7.2.3 7.2.4 7.2.5 7.2.6	Operation of safety relays K1-K2 of receiver RSRA Monitoring of main contactors : operation and wiring Restart button for receiver RSRA : description and wiring Wired safety stop device Application with safety light barrier muting Wiring an indicator light column	
8	«IF	startun» ontion	22
Ū	8.1.1 8.1.2	Connection of IR transmission module UJF to transmitter RSEF Connection of IR reception module UDF to receiver RSRA	
9	Ins	tructions for safe installation and commissioning	23
	9.1	General information	23
	9.2	Transmitter RSEF	23
	9.3	Receiver RSRA	23
	9.4	Positioning the antennas	23
1	0 D	eiagnostic	24
	10.1	Transmitter RSEF : Messages given by indicator lights V1 and V2	24



11	Servicing	27
12	Maintenance	
12.1	Replacement of a transmitter RSEF or a receiver RSRA	27
13	Warranty	
14	Appendices	
14.1	Component dimensions (mm)	29
14.2 14 14	2 Technical characteristics 4.2.1 Transmitter RSEF 4.2.2 Receiver RSRA	30
14.3	B Environmental data	31
14.4	Safety related parameters	31
14.5	5 Case Thermal capability	31
14.6	8 Residual risks	32
14.7	7 Forseeable misuse	32
14.8	3 Waste recycling and management	32
14.9	Products references	32
14.1	0 Warning, avoid any mutual disturbance	32
14.1	1 Countries limitation of the use	32
15	CE compliance statement	

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1 Safety rules and general precautions

The **RADIOSAFE (RS)** "wireless safety logic signal transmission system" is considered as a control and a safety component ensuring an emergency stopping function under the terms of the European Machinery Directive. The following safety rules apply to installation and use of the Radiosafe (RS) system.

- For maximum safety when using the system, the instructions given in this manual must be strictly observed.
- Radiosafe (RS) system operators must be appropriately trained and authorised to use the product.
- Radiosafe (RS) system operators must have uninterrupted visibility at all times 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 channels (for example, channels 5, 7, 9, ...) or by 5 channels when several systems are operating within a radius of 10 meters.
- In the event of a malfunction, the installation should be immediately shut down by pressing any emergency stop palmswitch and particulary that connected to the safety transmitter **RSEF**.

The product described in this manual is designed to satisfy the requirements of Machinery Directive 2006/42/EC based on application of the following standards :

- EN ISO 13849-1 : 2008 for performance level PLe (Category 4)
- EN 61508-1 to 7 : 2010 for SIL 3

2 Identification of components :

The "RADIOSAFE (RS) « Wireless safety logic signal transmission system » comprises the following components :

- > A safety transmitter ref. : RSEF, supplied with :
 - o A ¼ wave antenna, ref. : VUB084

A safety receiver, ref. : RSRA, supplied with :

A BNC elbow, ref. : VUB060

A ¼ wave antenna, ref. : VUB084

A 50 cm antenna extender, ref. : VUB170

A SIM card

0

0

0

0

- o A BNC elbow, ref. : VUB060
- A 50 cm antenna extender, ref. : **VUB170**
- o An installation and user manual (on CD rom)







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3 Product operating principle

The RADIOSAFE (RS) « Wireless safety logic signal transmission system» is used to transmit logic safety signals from one point of an installation to another.

The transmitter **RSEF** is designed to radio-transmit the following signals to the receiver **RSRA** :

- An emergency stop signal in the event of a problem occurring in the installation
- Up to 10 command signals

The receiver **RSRA** is integrated in the control component of the machine ; it enables (or not) operation of the machine and transmits the possible commands assigned to the buttons connected to the transmitter **RSEF**.

The receiver **RSRA** stops operation of the machine when any of the following conditions are present :

Case 1: Deactivation of a safety input (for example : contact on a gate or an emergency stop) connected to the transmitter **RSEF**

 \rightarrow Safety interlock subsequent to stop request.

- Case 2 : Action on emergency stop device wired to receiver RSRA. → Safety interlock subsequent to stop request.
- Case 3: Interruption of radio link during use When the system is in use, the transmitter RSEF has a continuous radio link with the receiver RSRA. Should this link be interrupted for more than 300 ms, the receiver automatically triggers stopping of the installation. → Safety interlock prior to loss of control of stopping function.
- Case 3 : Detection of a malfunction (see section : « Faults communicated by receiver »)

Schematic diagram :





4 Check of functions, initial startup

This section details the procedure for familiarisation with the product. It will allow you to test operation of the equipment in its « ex-factory » configuration.

4.1 Parameters on delivery « ex-FACTORY »

Transmitter RSEF	
Radio channel number	: No. 64 (434,675Mhz)
Radio transmit power level	: According to model of transmitter RSEF
Self check of inputs E1 to E10 on power up	: Yes
Transmitter restart mode	: Manual restart

Receiver RSRA

Time delay ⁽¹⁾	: «	A	» selector switches of receiver RSRA set to position « 5 »
Receiver application program	: «	В	» selector switches of receiver RSRA set to position « 2 »

(1) « Secure area access inhibit » time delay if function used

4.2 Installing the SIM card before startup of transmitter RSEF

• Step 1 Switch off the transmitter RSEF before any installation or change of SIM card.

Using a flat tip screwdriver, open the cover on the front panel :



Step 2

Insert the SIM card supplied with the receiver RSRA or supplied separately (pay attention to insertion direction) :



• **Step 4** Close the cover on the front panel.

Notes

The SIM card contains the complete configuration of the system :

- system operating frequency,
- Identity code of pair formed by transmitter RSEF + receiver RSRA,

In the event of a transmitter failure, the SIM card can be used in a backup transmitter.

To modify the basic parameters, refer to section 5.



4.3 Preliminary steps before installation

Once you have inserted the SIM card in the transmitter **RSEF**, proceed as follows to perform a quick test on the components before final installation.

4.3.1 Safety transmitter RSEF : terminal strip and test wiring diagram



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	
11	output	
12	Ind. light V1	
12	output	
13	White wire UJF	
14	Blue wire UJF	
15	V- Inputs	

Terminal	Function
16	V- Inputs
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

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

Transmitter test wiring (does not take account of application) ; this V3 wiring is intended to test a command input and the « emergency stop » safety input :



• Step 1

- tep 1 Prepare a stabilised power supply, 24VDC (+/- 5 %) 500 mA minimum
- Step 2 Wire the transmitter as follows :
 - Connect the +24VDC of the stabilised power supply to terminals 3 and 4
 - Connect the ground of the power supply to the 2 terminals 1 and 5 and 15 (ground ref. of inputs)
 - Connect an NC double contact emergency stop button to terminals 7, 8, 9 and 10.
 - Connect an NO button simulating an input across the +24VDC and terminal No. 22 (E1).
 - If the receiver is equipped with the « IR startup », function, connect the IR transmission module **UJF** to terminals **13** (White wire), **14** (Blue wire) and **0V** (braid).
 - 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 Supply the transmitter.
- Step 4 Activate the safety input (unlock Emergency stop).
- Step 5 Press on the Restart pushbutton. Indicator light V3 of the transmitter should come on steady, indicator light V1 should flash regularly (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 supply to the transmitter. Proceed as instructed in the following pages to wire the safety receiver **RSRA**.



4.3.2 Safety receiver RSRA : terminal strip and test wiring diagram





Safety inputs and outputs					
Terminal	Function				
A1+	V+ RSRA				
A2 -	Common ground				
48	24V static output : safety module status				
58	Radio reception status				
S11 Input 1 for 1st emergency stop or 1st safety light barrie					
S12	······································				
S13	Input 2 for 1st emergency stop or 1st safety light barrier				
S14					
S21	Input 1 for 2nd amorganov stop or 2nd safety light barrier				
S22					
S23	Input 2 for 2nd emergency stop or 2nd safety light barrier				
S24					
S34	Specific Input (used for safety light barrier muting)				
S42	Input for wired START pushbutton				
Y1	Input for auxiliary relay return loop				
Y2	input for duxinary foldy foldin loop				
13	1st safety output (NO contact)				
14					
23	2nd safety output (NO contact)				
24					
33	3rd safety output (NO contact)				
34					

Static outputs assigned to transmitter RSEF					
Terminal	Function				
A3+	24VDC power supply of outputs				
A2-	Common ground				
27					
37					
47	Function outputs assigned to inputs of transmitter				
57	RSEF (see detail below)				
67					
77					

Connection for IR reception module UDF				
Terminal	Function			
A5+	12VDC output			
IR	Receiver signal			
A2-	Common ground			

Receiver indicator lights					
Ind. light	Function				
V1	(WHITE) "Safety receiver status"				
V2 (WHITE) "Safety receiver status"					
V3	(RED) "Wrong identity code"				
V4	(GREEN) Radio reception quality				
K1	(GREEN) « Status of safety relay K1 »				
K2	(GREEN) « Status of safety relay K2 »				

Assignment of inputs connected to transmitter RSEF and static outputs of receiver RSRA :

Receiver RSRA with	assignment	of « standard	» outputs
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		Assignment of outputs of receiver RSRAxSxxx (terminal No.)						
		27 37 47 57 67						
	E1	Х						
	E2		Х					
	E3			Х				
Inputs of	E4				Х			
transmitt	E5					Х		
	E6						Х	
e RSEF	E7							
	E8							
	E9]						
	E10							

Receiver RSRA with assignment of « combined » outputs

			As	Assignment of outputs of receiver RSRAxCxxx (terminal No.)						
			27	37	47	57	67	77		
		E1	Х				Х			
		E2		Х			Х			
		E3			Х		Х			
	Inputs of	E4				Х	Х			
	transmitt	E5					Х			
		E6	Х					Х		
	erRSEF	E7		Х				Х		
		E8			Х			Х		
		E9				Х		Х		
		E10						X		



Receiver test wiring (does not take account of application : this wiring is aimed at testing a command output and an « emergency stop » safety input :



• Step 1 Prepare a stabilised power supply, 24VDC s (+/- 5 %) 500 mA minimum

• Step 2 Wire the receiver as follows :

- Shunt the terminal pairs [S21-S22], [S23-S24] and [Y1-Y2]
- Connect the +24VDC of the stabilised power supply to terminals A1+, A3, A4 and 13
- Connect the ground of the power supply to the two terminals A2-.
- Connect an NC double contact emergency stop button to terminals S11,S12,S13 and S14.
- If the receiver is equipped with the « IR startup » function, connect the IR transmission module **UDF** to terminal **IR** (blue wire) and terminal **A5+** (white wire).
- Possibly, 3 indicator lights from a light column may be connected to terminals: 58 (radio reception status), 48 (safety receiver status) et 14 (K1-K2 safety relays status).

• Step 3 Supply the receiver Indicator light V1 on the receiver comes on steady and indicator light V2 flashes regularly.

• Step 4 Switch off the receiver Perform the system test as detailed in the next section.

4.3.3 System test before installation

- Step A Supply the transmitter **RSEF** and the receiver **RSRA**
- Step B On the safety transmitter **RSEF**, press on the restart pushbutton.
- Step C The transmitter should be transmitting and its green indicator light V1 should come on steady.
 <u>If the « IR startup » option is present :</u> set up the IR transmission module UJF and the IR reception module
 UDF facing each other.
 The safety relays (K1 and K2) of the receiver **PSPA** should engage (the two green indicator lights K1 and
 - The safety relays (K1 and K2) of the receiver **RSRA** should engage (the two green indicator lights, K1 and K2, on the receiver should come on steady and indicator light V2 should go off)
- Step D Press the « input No. 1 » button connected to the transmitter **RSEF**
 - The voltmeter connected to output No. 27 of the receiver RSRA should indicate a voltage of 24VDC (output No. 27 of receiver corresponding to input No. 1 of transmitter has been activated).
- Step E Press the emergency stop palmswitch connected to the transmitter RSEF
 The receiver safety relays should immediately deactivate.



5 Modifying the configuration of the transmitter **RSEF**

The various settings on the transmitter **RSEF** are made using a **DIP switch** and a validation button located inside the transmitter.

Remove the front panel to access these components:







5.1 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 » which there may be between the transmitter and the receiver,
- Identify the frequencies used for all the radio transmitters located within a radius of 2xD max.
- Chose 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 **RSRA**. The receiver must be supplied throughout the channel modification procedure in order to receive the radio channel change command from the transmitter **RSEF**.

- 1- Deactivate the safety input of the transmitter **RSEF** (1)
- 2- Select the new radio channel using micro-switches 1 to 6 (see correspondence table below)
- 3- Activate the safety input of the transmitter RSEF (2)
- 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 :



- 5- Once you have chosen the radio channel, press the validation button BPV
- 6- The two indicator lights, V1 and V2, flash simultaneously and the transmitter sends the receiver **RSRA** the radio channel change command (this action takes around 20 s.)

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

- 7- To exit the radio frequency setting modes, activate, then deactivate the safety input (1)(2).
- 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.

Radio channel programming table :

Note : For the « extended range » version, only channels 40 to 64 are accessible.

Chan	Freq.		n				
onan.	(MHz)	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

Chan	Freq.		Ν	licro-switch position			
Chan.	(MHz)	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	ÓN

Note :

If the other setting has also been modified during this procedure (as "input check" or "restart mode"), each modified setting have to be validated <u>one by one</u>.



5.2 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 on power up of the transmitter **RSEF**. If a contact is « closed» on power up, the transmitter will indicate an error by indicator lights **V1** and **V2** (4 flashes).

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

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



- 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.
- 4- Press the validation button BPV ; indicator lights V1 and V2 go off.
- 5- To exit this configuration mode, deactivate, then activate the safety input (1)(2).
- 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) :



Error contact state of one or more inputs when transmitter **RSEF** is powered on

Note :

If the other setting has also been modified during this procedure (as "Radio channel number" or "restart mode"), each modified setting have to be validated <u>one by one</u>.



5.3 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.

This function is configured using micro-switch No. 8

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



- 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.
- 4- Press the validation button (BPV) ; indicator lights V1 and V2 go off.
- 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.



Note :

If the other setting has also been modified during this procedure (as "Radio channel number" or "restart mode"), each modified setting have to be validated <u>one by one</u>.



6 Modifying the configuration of the receiver RSRA

6.1 Selecting the application program ("B" selectors)

The receiver **RSRA** has 3 programs which can be configured using the 2 « **B** » rotary selector switches. Remove the front panel from the receiver for access to the selector switches.

ATTENTION: switch off the receiver RSRA before any manipulation of the programming selectors.



Important : The two « B » selector switches must be set to the same position to validate the selected program.

Choice of the application program	n according to the wished restart	mode of safety receiver RSRA :
-----------------------------------	-----------------------------------	--------------------------------

Position of « B » selector switches	Receiver restart mode after a deactivation of the receiver safety input nb.1 (wired on terminals « S11 to S14 »)	Receiver restart mode after a deactivation of the transmitter safety input (wired on terminals nb «7 to 10») or loss of radio link	Dangerous area access control	Startup by IR validation	Remarks
0, 5 or 7	Manual (1)	Automatic (4)	NO		Identical functioning for these 3 programs
1, 3 or 6	Manual (1)	Manual (2)	NO	YES, possibly	Manual restart mode to be privileged. Identical functioning for these 3 programs
2 or 4	Automatic (3)	Automatic (4)	NO	application risk analysis)	Automatic restart mode to be privileged. Identical functioning for these 2 programs
8	Manual (1)	Automatic (4)	YES		/
9	Manual (1)	Manual (2)	YES		/

Restart procedures of the receiver RSRA :

- (1) = Manual restart procedure :
 - 1. Reactivate the receiver safety input connected to terminals « S11 to S14 »,
 - 2. Deactivate then activate the transmitter safety input
 - 3. If the safety transmitter is configured in manual restart, press the restart pushbutton connected to terminal nb.17
 - 4. Restart the safety receiver with the pushbutton connected to terminal S42

(2) = Manual restart procedure :

- 1. Deactivate then activate the transmitter safety input
- If the safety transmitter is configured in manual restart, press the restart pushbutton connected to terminal nb.17
 Restart the safety receiver with the pushbutton connected to terminal S42

(3) = Automatic restart procedure :

- 1. Reactivate the receiver safety input connected to terminals « S11 to S14 »
- 2. Deactivate then activate the transmitter safety input
- If the safety transmitter is configured in manual restart, press the restart pushbutton connected to terminal nb.17 PS : The safety receiver is automatically restarted.

(4) = Automatic restart procedure :

- 1. Reactivate the transmitter safety input,
- 2. If the safety transmitter is configured in manual restart, press the restart pushbutton connected to terminal nb.17 PS : The safety receiver is automatically restarted.



6.2 Safety input nb.2 : Selecting the muting time ("A" selectors)

For specific applications (e.g : "Dangerous area access control"), the receiver **RSRA** can control the state of a safety light barrier outputs and allow the delayed inhibition of this one.



The temporization of the request for cutting the safety light barrier beams (from the transmitter **RSEF**) and the duration of the barrier muting are programmed by 2 selectors "A" on the receiver **RSRA**.

ATTENTION: switch off the receiver **RSRA** before any manipulation of the programming selectors.



Important: The two « A » selector switches must be set to the same position to validate the selected time delay.

Position of «A» selector switches		1	2	3	4	5	6	7	8	9
Request for cutting the safety light barrier beams	5 s.	6 s.	7 s.	8 s.	9 s.	10 s.	15 s.	20 s.	25 s.	30 s.
Inhibit time (1) (Muting)	5 s.	10 s.	20 s.	40 s.	1 min.	2 min.	3 min.	4 min.	5 min.	10 min.

(1) = This time corresponds to the safety light barrier muting time. Once the barrier has been crossed over, the muting function is stopped to prevent any other unauthorised person from entering the area.





7 Wiring the components

7.1 Wiring the transmitter **RSEF**:

NOTE 1: See description of connection terminals in section 4.3.1.

NOTE 2: See correspondence between inputs of transmitter RSEF and outputs of receiver RSRA in section 4.3.2.

Typical wiring diagram with emergency stop palmswitch connected to safety input and 10 dry-contact inputs (No pushbuttons).



Example connection of a safety light barrier on transmitter safety input:



Example with static inputs (PLC for example) :





7.2 Wiring the receiver RSRA :

NOTE 1 : See description of connection terminals in section 4.3.2.

NOTE 2 : See correspondence between inputs of transmitter RSEF and outputs of receiver RSRA in section 4.3.2.

CAUTION : The loads connected to the receiver outputs must not consume more than 100 mA with 24VDC.

7.2.1 Operation of safety relays K1-K2 of receiver RSRA

Interruption of the safety stop chain is ensured by safety relays K1 and K2 (internal to receiver **RSRA**) which control the contacts accessible by terminals 23-24 and 33-34.

The state of relays K1 and K2 depends on :

- the safety input of the transmitter RSEF ,
- the safety input of the receiver **RSRA** (a),
- possible faults detected,
- possible loss of radio link.
- Possible loss of power supply of safety transmitter or safety receiver.
- (a)= 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 S11-S12 / S13-S14). The state of these inputs will act directly on relays K1 and K2.

7.2.2 Monitoring of main contactors : operation and wiring

The input connected to terminals **Y1-Y2** is used to monitor the state of the contactor(s) connected to the **K1-K2** safety outputs.

The state of the contactor(s) contact(s) wired on this input **Y1-Y2** must be closed in order to start or to restart the receiver **RSRA**.

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





7.2.3 Restart button for receiver RSRA : description and wiring

When a safety stop has been triggered (action on emergency stop or possible faults), safety relays K1 and K2 of the receiver de-energise and open the contacts accessible by terminals 23-24 and 33-34.

Depending on the application program selected using the two « **B** » selector switches of the receiver, the safety relays will be restart either **automatically** (program No. 2) or **manually** by restart request using a pushbutton wired to input **S42** (programs 0 and 8).



7.2.4 Wired safety stop device





Plan of the application :



Purpose of the process:

The machine (a) has to stay in functioning during the intervention of the fork-lift (b) (raw materials reloading).

Description of the process :

- Contacts of RSRA (c) safety relays K1 and K2 are placed in the machine (a) stop chain.
- The safety light barrier (d) which protects machine access zone is controlled by the recevier RSRA (c).
- To unload the fork lift (b), the operator must perform a « request for muting the safety light barrier » with the dedicated pushbutton (e) connected to transmitter **RSEF** (f).
- This request launches a temporization (1) wich inhibits safety light barrier outputs (d).
- The orange indicator light (g) (2) connected to output nb.58 of receiver RSRA (c) is blinking during all muting time.
- During barrier beams cutting, safety relays K1 and K2 of the receiver RSRA (c) remain activated.
- If safety light barrier (d) is enterely crossed, the mutin gis stopped to to prevent any other person from entering.
- When the fork lift (b) ended its unload operation and when it doesn't cut any more the barrier beams (d), this one is automatically reactivated without stopping the functioning of the machine (a).

(1) = The safety light barrier muting time is programmable on the receiver RSRA, with 2 « A » selectors.
 (2) = This indication is not secured.

Functioning limit :

The distance between the transmitter **RSEF** and the receiver **RSRA** will depend on the environment (approx. 350m in opened space with "extended range" transmitter **RSEF** version)



Implementation:

1. Programming of the sfety light barrier muting time (on receiver RSRA) :

The request delay and muting time are programmable by the 2 "A" selectors of the receiver **RSRA** (see chapter 6.2)

- 2. Selecting the « Access control in dangerous zone » (on receiver RSRA) : Select the application program nb.8 on the receiver RSRA dedicated to this usage (see chapter 6.1)
- 3. Programming the restart mode of the transmitter RSEF :

The transmitter RSEF has to be in automatic restart mode (see chapter 5.3)

4. Wiring diagram of the transmitter RSEF:

A pushbutton connected on terminal nb.22 (E1 input) will serve as access request.



5. Wiring diagram of the receiver RSRA :

• The output **nb.27** (associated to **E1** transmitter input) must be connected to receiver terminal **S34** to perform the request of access in machine zone.

Note : The input **S34** is auto-checked by the receiver, if this input is permanently activated (by the "access request" pushbutton) during an upper time than the access time selected with 2 "**A**" selectors, the safety relays **K1** and **K2** of the receiver **RSRA** will be deactivated.

 A restart pushbutton must be connected to input S42 to restart the receiver in case of safety light barrier crossing without preliminary request by the operator.





7.2.6 Wiring an indicator light column

An indicator light column should be wired to the receiver. The column will indicate the status of the equipment monitored and of the receiver **RSRA**. The indicator light status sheet should be fastened near to the indicator light column (Example given in last page of manual).

The consumption of each indicator light of the column must not exceed 100 mA 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 a safe information (no checking of its correct operating).

Status of indicator lights of indicator light column :



Ind. light column	On steady	Flashing	Off	Remark
Red	Equipment stopped	Receiver on standby for restart	Equipment operating	Red and orange indicator lights flash a specific
Orange	Transmitter active (radio transmission)	Area access request	/	event of a receiver malfunction
Green	Equipment operating	/	Equipment stopped	





8 «IR startup» option

This option is only available for receivers **RSRA** equipped with this functionality. This option can be used if it requested by the application risk analysis.

The startup zone for a machine and its identification can be secured by an IR validation on startup

- To start the equipment, the IR reception module **UDF** connected to the receiver **RSRA** must be placed in the IR transmission area of the module **UJF** connected to the transmitter **RSEF**.
- Once the validation has been carried out, the transmitter **RSEF** and the equipment to be controlled are paired with no possibility of error (the IR link is coded and does not allow to perform an involuntary association).
- The operator can then move the transmitter / receiver with no limitation.

The IR startup function has a range of action of 0 to 10 m.

Note : The cable used for interconnection between the IR modules and the safety units has a length of 10m. This length can be extended to up to 30m (max.) using shielded extensions referenced : **UDWR10**.



8.1.1 Connection of IR transmission module UJF to transmitter RSEF

IMPORTANT : The **UJF** module must be wired separately from the power cables and all other sources of interference (power regulator, for example).

Black wire : terminal No. 5 (Common ground) White wire : terminal No. 13 Blue wire : terminal No. 14



8.1.2 Connection of IR reception module UDF to receiver RSRA

IMPORTANT : The **UJF** module must be wired separately from the power cables and all other sources of interference (power regulator, for example).

Black wire : terminal A2- (Common ground) White wire : terminal A5+ Blue wire : terminal IR





9 Instructions for safe installation and commissioning

9.1 General information

Experience has shown that functional reliability basically depends on :

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

9.2 Transmitter RSEF

The installer shall:

- Install the product near the control area.
- Provide, if necessary, a location for a transmitter restart button in order to start the transmitter following a malfunction or following an emergency stop condition.
- Connect a 0.5 amp delay-action fuse protection device in series on input Vin No. 4 (24V DC) of the transmitter.
- Familiarise yourself with all the characteristics given in the « technical characteristics » section.

9.3 Receiver RSRA

The installer shall:

- Wire a cabled emergency stop device on the front panel of the unit.
- Provide a location for a restart button, required to restart the receiver module when commissioning, following a fault
 or following an emergency stop condition.
- 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 given in last page of this manual).
- Connect a 1 amp delay-action fuse protection device in series on input A1 (24V DC) of the receiver.
- Familiarise yourself with all the characteristics given in the « technical characteristics » section;

9.4 Positioning the antennas

Both the transmitter and receiver are supplied with an antenna, a 50 cm antenna extender and a BNC-BNC elbow.

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.

If poor radiowave propagation is observed, for example : closed area, the antenna should be remote-mounted :





10 Diagnostic

10.1 Transmitter RSEF : 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 V1 and V2	Action
After transmitter power up	OFF	ON for 1 second, then OFF	Transmitter initialisation phase	/
After transmitter power up or after deactivation/activation of safety input	ON	OFF	On standby for action on restart button (restart mode programmed for « manual »)	 Press restart button to place 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 radio channel (40 to 64)

Abnormal operation :

Transmitter status	V1 (GREEN)	V2 (RED)	Message indicated by indicator lights V1 and V2	Solution
After transmitter power up	OFF	OFF	Power supply problem, transmitter not supplied	 Check power supply voltage Check condition of protection fuse
After transmitter power up	ON	ON	SIM card read error	 SIM card not present, SIM card incorrectly inserted SIM card faulty (must be replaced)
After transmitter power up	4 flashes	4 flashes	« Input check » function has detected an error	 Check transmitter wiring, NO contacts of inputs must be in « idle » position on transmitter power up
Operating	5 flashes	5 flashes	Configuration micro-switches	- Re-position configuration micro-switches to their initial positions and activate then
Operating	6 flashes	6 flashes	changed	deactivate the safety input to clear the error.

Note : Indicator light V3 of the transmitter indicates that the transmitter is correctly supplied. If off, check that the product is properly supplied.



10.2 Receiver RSRA : Messages given by indicator lights

To indicate faults, the receiver has 4 indicator lights, V1 to V4.

The 2 white indicator lights, « V1 and V2 » indicate the status of the safety functions of the receiver.

The red and green indicator lights « V3 and V4 » indicate the status and processing of radio signal reception.

10.2.1 Messages given by indicator lights V1 and V2



V1 (white)	V2 (white)	Error detected	Cause(s)	Action(s)
On steady	On steady	None	Transmitter in radio transmission mode	None
			Restart not done.	Press restart button
On steady 1 flash		Restart fault	Radio link between transmitter and receiver not established (V4 off).	Configure a radio channel (transmitter side)
			In « area access » mode, the area crossover button connected to the transmitter has not been released following a crossover request.	Press the restart button to cancel the error
Off	Off	Communication problem	Problem internal to product	Return to factory
On steady	2 flashes	Protection not active	Emergency stop palmswitch(s) locked	Check status of buttons, contacts and wiring
On steady	3 flashes	Time delay error	Contacts of a safety device (emergency stop or safety light barrier) have not been activated in required time frame	 Close contacts simultaneously. Press restart button
On steady	4 flashes	Restart button fault	Contact of restart button has remained closed	Check condition and type of contact in restart button (temporary-action pushbutton)
Off or 5 flashes	Off or 5 flashes	Configuration error	A or B selection switches are not set to same position. The « Off » or « 5 flashes » condition depends on whether the selector switches have been configured with power on or power off	Switch off the receiver power supply and check the position of the A and B selector switches
6 flashes	Off	Undervoltage	6 flashes on V1: Power supply voltage of receiver is less than 0.85Un	Check receiver power supply
Off	6 flashes	Overvoltage	6 flashes on V2: Power supply voltage of receiver is greater than 1.15Un	
Off	7 flashes	Input(s) error	One of the safety inputs is incorrectly wired	Check wiring
8 flashes	8 flashes	Safety relay error	One of the safety relays, K1 or K2, or their control circuit is faulty	Return to factory
Off	8 flashes	Safety relay error	Return loop to terminals Y1-Y2 not closed when safety outputs are inactive.	Check Y1 and Y2 loop and contacts of external relays K3, K4.
Off	9 flashes	Relay K1-K2 fault	Control circuit of one of the safety relays is faulty	Return to factory
Off	10 and 11 flashes	Program error	An error has occurred during program run	Return to factory
Off	12 flashes	Version error	Software versions of 2 microprocessors are different	Return to factory
Off	13 and 14 flashes	Memory error	Memory fault	Return to factory



10.2.2 Messages giver	n by indicator	lights V3 and V4
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Ind. Light	Mode	Indication	Message	Status
V3 (RED)	Normal	Indicates validity of identity code	No message reception	OFF
			Message reception with correct identity code	OFF
			Message reception with incorrect identity code	Flashes regularly
	lf fault detected	Indicates a fault	Power supply error	2 flashes
			Safety relay	3 flashes
			EEPROM	4 flashes
			RAM	5 flashes
			ROM	6 flashes
			Micro type	7 flashes
V4 (GREEN)	Normal	Indicates radio reception quality	No radio reception	OFF
			Poor radio reception	Flashes
			Good radio reception	ON
	lf fault detected	Indicates a fault	Power supply error	2 flashes
			Safety relay	3 flashes
			EEPROM	4 flashes
			RAM	5 flashes
			ROM	6 flashes
			Micro type	7 flashes



11 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.

12 Maintenance

Spare part accessibility depends on training level of end user:

- Level 1 : Spare parts not requiring any tools or special know-how. Example : SIM card, etc.
- Level 2 : Spare parts accessible only to customers having completed level 2 training, and to JAY Electronique service stations.

12.1 Replacement of a transmitter RSEF or a receiver RSRA

Without unwiring the product, proceed as detailed below :

- **1-** Switch off the power supply
- 2- Remove the front panel from the product (Fig.1)
- 3- Transmitter RSEF : Remove the SIM card (Fig.2)
- 4- Disconnect the removable terminals by applying a turning action using a flat tip screwdriver (Fig.3)
- 5- Re-program the new product identically to the old product (Fig.4)
 - > Micro-switches set identically for transmitter
 - « A » and « B » selector switches for receiver
- 6- Transmitter RSEF : insert the SIM card in the new transmitter
 - Use the SIM card taken from the faulty transmitter
 - > Or, insert the new SIM card supplied with the new receiver
- 7- Connect the removable terminals on the new product (Fig.5).
- 8- Connect and supply the new product and proceed with tests.









13 Warranty

All our products are guarantied 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,
- insufficient monitoring or servicing, or any use not compliant with the specifications given in the 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.



14 Appendices

14.1 Component dimensions (mm)

- Safety transmitter RSEF
- Safety receiver RSRA



• IR transmission module UJF • IR reception module UDF

(for "IR startup" option)



BNC plug-in antennas VUB····

IMPORTANT : The antenna VUB086 must not be used for the transmitter RSEF.





14.2 Technical characteristics

14.2.1 Transmitter RSEF

Mechanical and environment withstand characteristics

Housing material : Plastic

Protection index : 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 0.08² to 2.5²

Antenna: 1/4 wave VUB084, as accessory, plug-in on BNC connector

Radio characteristics

Radio transmission frequencies :

(Interval between adjacent channels : 0.025 MHz)

RSEF40 : 64 frequencies, from 433.100 MHz to 434.675 MHz

RSEF41 : 25 frequencies, from 434.075 to 434.675 MHz

Transmit power : ≤10 mW

Average range in typical industrial environment (1) :

RSEF40: 150 m

RSEF41 : 250 m

Electrical and functional characteristics

Power supply voltage : 24 V DC SELV/PELV +/- 20%

Max. consumption : 500 mA

Number of inputs : 12

- 1 safety input (for emergency stop, safety light barrier, 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 ${\rm V}$

Consumption of an input active at high level : < 20 mA

Maximum frequency of a signal on an input : 10 Hz max

Static output :

Number and type of outputs : 2 PNP outputs (Images of indicator lights V1 and V2)

Output voltage : 24 V DC, 100 mA max.

Indication: 3 indicator lights

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



14.2.2 Receiver RSRA

Mechanical and environment withstand characteristics				
Housing material: Plastic				
Protection index: IP 40				
IMPORTANT : receiver RSRA 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), with screw for wires 0.08 ² to 2.5 ²				
Antenna: ¼ wave, VUB084, as accessory, plug-in on BNC connector				
Electrical characteristics				
Power supply voltage : 24 V DC SELV/PELV +/- 20%				
Max. consumption : 120 mA (non-loaded static outputs)				
Safety relay outputs :				
Contacts : 3 NO forcibly guided contacts				
Tripping time (reaction) :				
Active stop time following activation of transmitter safety input : 50 ms				
- 300 ms for emergency stop according to EN 60204-1				
- 1.5 s for a safety stop according EN 60204-32 para 9.2.7, If the requirement of the risk analysis allows it				
Max. switching voltage : 250 V AC				
Switching capacity :				
• Per AC 15 : AC 3 A / 230 V for NO contacts EN60947-5-1				
• Per DC 13 : DC 8 A / 24 V at 0.1 Hz EN60947-5-1				
Static outputs (not secure) :				
Number and type of outputs : 6 PNP outputs				
Output voltage: 24 V DC, 100 mA max.				
Indication : 6 indicator lights				

14.3 Environmental data

EMC, product fulfils following standards EN301489-3 V1.4.1; EN61000-6-2 (2005); EN62061 (2005) annex E.

Mechanical, product fulfils following standards vibrations EN60068-2-64 (1994).

Wireless product fulfils following standards EN 300220-2 V2.1.2 (Ed.04.2006) and EN300330-2 V1.3.1

14.4 Safety related parameters

Performance level e, Sil3 for emergency stop function.

14.5 Case Thermal capability

Power supply, plus any input or output, 24VDC power supply, Pmaximum = 18watts.



14.6 Residual risks

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

14.7 Forseeable misuse

Polarity inversions of the safety transmitter or safety receiver power supply : no starting up of products.

Other misuse of the safety transmitter RSEF : see Diagnosis paragraph 10.1.

Other misuse of the safety receiver RSRA : see Diagnosis paragraph 10.2.

14.8 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.

14.9 Products references

See the sales documentation of the product.

14.10 Warning, avoid any mutual disturbance

Be certain that the wireless System doesn't disturb other Systems and that it is not being disturbed itself by other Systems.

Use different codes and different frequencies.

14.11 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).



15 CE compliance statement





In area

Area access





RADIOSAFE (RS) Appendix, installation manual 332730



