RD800x RFID Safety Transponder – DE/EN/FR/IT/ES/PT/RU/ZH – 08/2013 - Part No. 700151

Safety transponder series RD800x Application information

1. Introduction:

Thanks to the contact-free transponder technology (RFID), the safety-related sensors of the RD800x series provide extremely long-lasting, reliable and tamperproof position detection of moving guards.

Sensor and actuator are delivered as a pre-programmed combination:

- Unique code (only one actuator is accepted by the sensor) or
- Standard code (one actuator series is accepted by the sensor)
- For single or sequential use

In addition, RD800 sensors are available which can learn different actuator codes as often as needed. All models are available with M12 plugs exiting from the left or the right or PVC cables.

The RD800x series thereby offers safety and flexibility for many applications.

2. Application information, warning notices:

Selection and use of the RD800x only acc. to the respectively applicable instructions, and relevant standards, rules and regulations regarding labor protection and safety at work, particularly: EN 60947-5-3/A1, EN 13849-1, EN ISO 13849-2, EN 62061, EN 60204-1, EN 1088, EN ISO 12100-1, EN ISO 12100-2.

- Only handle the RD800x if you have read and understood the operating instructions.
- Connection, start-up and regular testing only by competent personnel.
- The safety level is defined by the weakest link in the safety-related chain.
- Testing of the safety-related components for proper protective function, particularly before start-up and thereafter at least once a year, or at shorter intervals depending on the application.
- During all conversions, maintenance work and inspections, the system must be securely shut down and protected against restarting.
- If stepping behind the guard is possible, a start/restart interlock is mandatory.
- A dangerous process may only be started when the safety sensor is activated.
- Do not use the RD800x in strong magnetic or electromagnetic fields.
- Avoid shocks and vibrations to improve system availability.
- Do not use the sensor as a mechanical limit stop.
- Always exchange sensor with actuator (other than RD800-MP-x).
- Take electrostatic precautionary measures (ESD) before handling the RD800x.
- Only operate the safety-related chain with separate 24 V current supply (PELV or SELV).
- Connection via protected wiring.
- Alignment and testing of the RD800x for distances "on" (Sao) and "enabled" (Sar) acc. to figure "Safety-related distances".
- Exchange sensor after max. 20 years.

Observe the technical data in chapter 9.

3. Application information, use:

- As safety device together with Safety Relays or safety controls (EN 60204).
- Up to and incl. safety category 4 / PL e (EN ISO 13849-1) as well as SIL CL 3 (EN 62061).

Exemption of liability of Leuze electronic GmbH + Co. KG in the following cases:

- The sensor is not being used properly.
- Safety notices are not adhered to
- Testing is not performed by authorized instructed personnel
- Faulty mounting, connection, start-up
- Deficient execution of tests for proper protective function
- Reasonably foreseeable misuse is not taken into account (e.g. manipulation, reaching behind the safety device).

4. Sensor status:

see Table 3 "Connection designations"

OFF: sensor without supply voltage

Ue switched on: state immediately after switching on the supply voltage. The sensor executes an internal diagnosis in this state with the f0 function. If this is successful, the sensor switches into the "Operation" state, or if an error exists, into the "Error" state.

Error: safe state, the outputs are deactivated.

- Display of an internal sensor error
- Short circuit between safety outputs OS1 and OS2
- Short circuit between OS1 or OS2 and ground
- Short circuit between OS1 or OS2 and 24 V

Reset by trouble shooting and restarting the sensor.

Operation: sensor is operating normally.

Function **f1** monitors the simultaneous application of the input signals on IS1 and IS2. At the same time, the **f2** function checks if the actuator is present in the safe activation area of the sensor. If these conditions are fulfilled, the **f3** function activates safety outputs OS1 and OS2. If conditions **f0** to **f3** are not fulfilled, the sensor switches the OSSDs off.

see Table 1 "Sensor status", see Figure 1 "Internal circuit diagram".

Switching distances when fulfilling conditions **f1**, **f0**:

If the actuator is brought into the safe activation zone (dark gray area), the sensor switches the OSSDs (OS1, OS2) on.

If the actuator leaves the safe activation zone, the OSSDs remain switched on. If the limit is reached (light gray surface), a signal is output.

If the actuator reaches the switch-off distance, the sensor switches the OSSDs off.

See Figure 3 "Safety-related distances".

See Figure 4 "Approach directions".

Observe the technical data in chapter 9.

Warning

The switching distances can be changed by strongly magnetic or electromagnetic influences (e.g. frequency inverters). Safe switching distances Sao and Sar must be tested after installation.

5. Programming (only RD800-MPx)

Sensors with program input (IS3) can learn the code of a new actuator. This can often be repeated any number of times; the actuator last taught is accepted.

Warning

Only authorized, competent personnel can teach new actuators.

The safety function must be tested.

Switching on of sensor supply voltage Ue. The sensor executes internal tests.

Activate the programming input (I3) by applying 24 V. The OSSDs are switched off.

The status of the inputs (IS1, IS2) is not relevant for teaching.

Introducing the new actuator to the sensor. The markings must be opposite each other.

"ACT" LED flashes green 4x if acceptance of the new code is successful.

Deactivating I3.

See Table 2 "Teaching process".

6. Installation:

The markings must be opposite each other.

Make sure the minimum distance of 50 mm between two sensor/actuator systems is observed, see Figure 2 "Minimum distance in mm".

Make sure the minimum distance of 1 mm between sensor and actuator is observed, use separate limit stop.

Select a form-fitting supporting surface for sensor and actuator.

Connect sensor and actuator in a permanent manner, e.g. using rivets or tamperproof screws (max. tightening torque of 0.8 … 2 Nm). To do this, use washers and close openings with cover caps (in the delivery contents), see Figure 5 "Mounting".

7. Connection and start-up:

See Table 4 "Pin assignment/core color".

When wiring with Safety Relays or safety controls, up to 32 RD800x can be connected in series. Safety category 4 / PL e (EN ISO 13849-1) or SIL CL 3 (EN 62061) is still reached for the sensors.

Ensure that the safety-related system (sensor with connected components) corresponds to the required PFH and $MTTF_d$ value of the application.

Note

- Inputs of the first sensor of the series connection to 24 V or on compatible OSSDs.
- OSSDs of the last sensor of the series connection must be evaluated by a Safety Relay (e.g. MSI-SR4) or safety control (MSI-100/200).
- The maximum permitted stray capacitance on OS1 and OS2 must be observed, see chapter 9.
- Whether the necessary reaction time of the safety-related system is observed must be checked.

The reaction time of the safety-related system is calculated as follows:

150 ms (first sensor) + 12 ms x number of additional sensors + reaction time of downstream components = total reaction time

see Figure 7 "Series connection with RD800-Mx"

8. Dimensions and weights:

	M12	Cable
Weight, sensor	57 g	150g
Weight, actuator	24 g	24 g

See Figure 6 "Dimensional drawing".

9. Technical data

Mechanical data	
Safety class	IP67 and IP69K
Plug type	M12, 8- or 5-pin
Housing material	Polyamide PA66
Dirt level, external	3
Shock resistance in acc. with EN 60068-2-27	30 gn; 11 ms
Vibration resistance in acc. with EN 60068-2-6	10 gn; 10 … 55 Hz
Temperature range, operation	-25 … +70 °C
Temperature range, storage	-25 … +85 °C

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Mechanical data	
Screw tightening torque, max.	0.8 … 2 Nm
Length of connection cable, max.	50 m

Cable lengths and cross sections influence pulses to the safety outputs. The capacity of the connection cables may not exceed the values listed in table "Safe outputs (OS1, OS2)".

Electrical equipment	
Supply voltage U_e	24 VDC -15 % … +10 %
Current consumption I_e	0.25 A
Conventional thermal current I_{th}	0.25 A
Nominal current, min.	0.5 mA
Switching power, max.	6 W
Power consumption (U_e)	< 1 W
Rated insulation voltage U_i	32 V
Pulse strength U_{imp}	1.5 kV
Guarding, internal, polyfuse (OS1+OS2+O3)	0.75 A
Fuse, external	1 A
Overvoltage category	III

Inputs (IS1, IS2, I3)	
Input voltage	24 VDC
Current consumption	5 mA

Safe outputs (OS1, OS2)	
Output voltage	24 VDC
Signal type	PNP
Output current, max.	0.25 A
Utilization category	DC12; U_e = 24 VDC, I_e = 0.25 A
Short circuit detection	Yes
Short circuit resistance	Yes
Test-pulse length	< 300 µs
Capacitance, max. between two outputs	< 200 nF
Capacitance, max. between an output and GND	< 200 nF

Signal output (O3)	
Nominal voltage, operation U_e1	24 VDC
Signal type	PNP
Output current, max.	0.1 A
Utilization category	DC12; U_e = 24 VDC, I_e = 0.25 A
Short circuit detection	No
Short circuit resistance	Yes

Use	
Assured cut-in distance Sao	10 mm
Assured reset distance Sar	16 mm
Nominal operating distance, Sn	12 mm
Nominal cut-out distance, Snr	14 mm
Repeatability	≤ 10 % sn
Switching hysteresis	≤ 20 % sn
Distance between 2 systems (sensors, actuator), min.	50 mm
Reaction time after switch-off, input, min., max.	7 ms, 12 ms
Reaction time after removing the actuator, min., max.	80 ms, 150 ms

10. Compatibility

Compliance with standards:
IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, EN 954-1, SN 29500, EN ISO 13849-1, EN ISO 13849-2, EN 62061, EN 60947-5-3/A1, EN 60947-5-2, EN 60947-1, EN 61326-1, EN 61326-3-1, EN 61326-3-2, ETSI 301 489-1, ETSI 301 489-3
Compliance with directives:
2006/95/CE, 2006/42/CE, 2004/108/CE

Certifications, compatibility:
CE, TÜV Süd, cULus
The FCC rules, section 15, are complied with.

Characteristic parameters	
SIL Level (SIL CL) in acc. with EN 62061:2005	Up to and incl. SIL 3
Performance Level (PL) in accordance with EN ISO 13849-1:2008	Up to and incl. PL e
Safety category in acc. with EN ISO 13849-1:2008	Up to and incl. category 4
PFH_d	1.45×10^{-9}
$MTTF_d$ (single channel)	4077 years
DC	High
Service life (T_M)	20 years
Classification (EN 60947-5-3)	PDF-M

11. Disposal

For disposal, observe the applicable national regulations regarding electronic components.

12. Service and support

Telephone number for 24-hour standby service:
+49 (0) 7021/573-0
Service hotline: +49 (0)8141 5350-111
Monday to Thursday, 8:00 a.m. to 5:00 p.m. (UTC+1) and Friday, 8:00 a.m. to 4:00 p.m. (UTC+1)
E-mail: service.protect@leuze.de

Return address for repairs:

Servicecenter
Leuze electronic GmbH + Co. KG
In der Braike 1, D-73277 Owen/Germany

13. EC Declaration of Conformity

Leuze electronic GmbH + Co. KG
In der Braike 1, D-73277 Owen/Germany

Hereby declares that the RD800x sensors and RD800x actuators conform with all relevant requirements of directive 2006/42/EC[1]. Standards used: EN ISO 13849-1:2008 + AC:2009.

Person authorized for the creation of technical documentation: André Thieme.

Owen, 08-09-2013, Ulrich Balbach, Managing Director

1. You can download the entire EC Declaration of Conformity as a PDF from: http://www.leuze.com/

14. Ordering remarks

Part no.	Article	Connector/Cable
Individual application, standard code		
63002000	RD800-SSCA-M12R	M12, on right side
63002050	RD800-SSCA-CB2-R	Cable, on right side
63002002	RD800-SSCA-M12L	M12, on left side
63002052	RD800-SSCA-CB2-L	Cable, on left side
Individual application, unique code		
63002001	RD800-SUCA-M12R	M12, on right side
63002051	RD800-SUCA-CB2-R	Cable, on right side
63002003	RD800-SUCA-M12L	M12, on left side
63002053	RD800-SUCA-CB2-L	Cable, on left side
Individual and series applications, standard code		
63002010	RD800-MSCA-M12R	M12, on right side
63002060	RD800-MSCA-CB2-R	Cable, on right side
63002012	RD800-MSCA-M12L	M12, on left side
63002062	RD800-MSCA-CB2-L	Cable, on left side
Individual and series applications, unique code		
63002011	RD800-MUCA-M12R	M12, on right side
63002061	RD800-MUCA-CB2-R	Cable, on right side
63002013	RD800-MUCA-M12L	M12, on left side
63002063	RD800-MUCA-CB2-L	Cable, on left side
Individual and series applications, programming flexible on RD8x-SCA or -UCA		
63002020	RD800-MP-M12R	M12, on right side
63002021	RD800-MP-M12L	M12, on left side
Actuator for RD800x, standard code		
63002100	RD800-x-SCA	
Actuator for RD800x, unique code		
63002101	RD800-x-UCA	

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Table 1: Sensor status

Sensor status	Actuator detected	2 input signals are applied	PWR LED	OUT LED	IN LED	ACT LED	OSSDs OS1/ OS2	Signal output O3	Description
Off	No	*	x	x	x	x	Off	Off	sensor not switched on
U_e switched-on	*	*	OR	x	x	x	Off	Off	internal test mode
Operation	Yes	Yes	gn	gn	gn	gn	On	On	monitored operation
Operation	No	Yes	gn	x	gn	x	Off	Off	input condition fulfilled
Operation	Yes	No	gn	x	x	gn	Off	On	actuator detected, input condition not fulfilled
Operation	No	No	gn	x	x	x	Off	Off	actuator not detected, input condition not fulfilled
Operation	Yes	Irregular	gn	x	OR/ GN-BU	gn	Off	On	check and deactivate both input signals
Operation	No	Irregular	gn	x	OR/ GN-BU	gn	Off	Off	check and deactivate both input signals
Operation	On the limit	Yes	gn	gn	gn	OR/ GN-BU	On	On	check actuator/realign door
Operation	On the limit	No	gn	x	x	OR/ GN-BU	Off	On	check and deactivate both input signals, test actuator/realign door
Operation	On the limit	Irregular	gn	x	OR/ GN-BU	OR/ GN-BU	Off	On	check and deactivate both input signals, test actuator/realign door
Error (output)	Yes	Yes	gn	RD-BU	x	x	Off	Off	testing for cross connection and short circuit
Error (internal)	*	*	RD	*	*	*	Off	*	restart or exchange

* = irrelevant

Table 2: Teaching process

Sensor status	Actuator detected	Input signals are applied	PWR LED	OUT LED	IN LED	ACT LED	OSSDs OS1/ OS2	Signal output O3	Description
Off	No	*	x	x	x	x	Off	Off	sensor not switched on
U_e switched-on	*	*	OR	x	x	x	Off	Off	internal test mode
Operation	No	*	gn	x	gn	x	Off	Off	now connect input I3 (pin 8) with 24 V
Programming	No	*	gn	x	OR-BU	x	Off	Off	sensor is waiting for new actuator
Programming	Yes	*	gn	x	or	GN-BU (4x)	Off	Off	actuator taught
Programming	*	*	gn	x	x	x	Off	Off	now separate input I3 (pin 8) from 24 V
Operation	For further operation, see Table 1								

* = irrelevant

Table 3: Connection designations

Des.	Function
A1	Ue = 24 V
IS1	Input 1
A2	0 V
OS1	OSSD 1, safe output
O3	Message output
IS2	Input 2
OS2	OSSD 2, safe output
I3	Programming input

Table 4: Pin assignment/core color

Pin	RD800-Sx	Wire color	RD800-Mx	RD800-MPx	Wire color
1	A1	Brown	A1	A1	Brown
2	OS1	Red/white	IS1	IS1	Red
3	A2	Blue	A2	A2	Blue
4	OS2	Black/white	OS1	OS1	Red/white
5	O3	Black	O3	O3	Black
6			IS2	IS2	Violet
7			OS2	OS2	Black/white
8			n.c.	I3	Violet/white

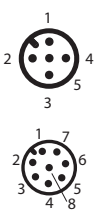


Figure 1: Internal circuit diagram

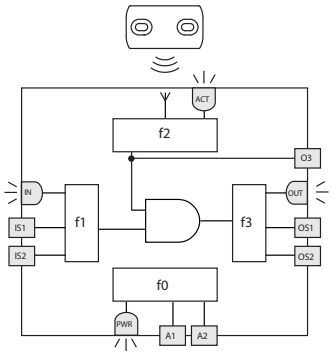


Figure 2: Minimum distance in mm

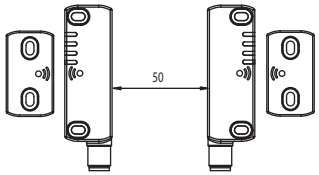


Figure 3: Safety-related distances

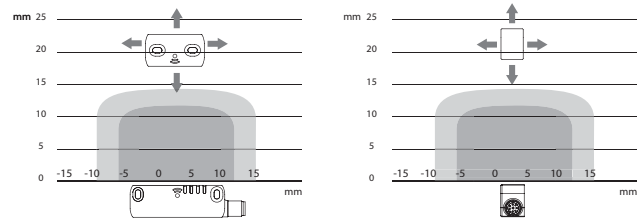


Figure 4: Approach directions

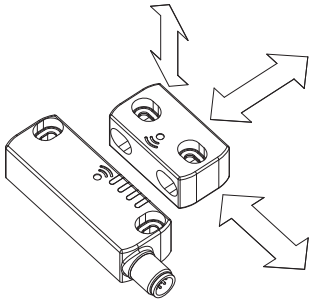


Figure 5: Mounting

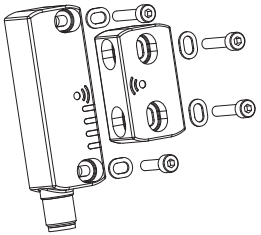


Figure 6: Dimensional drawing

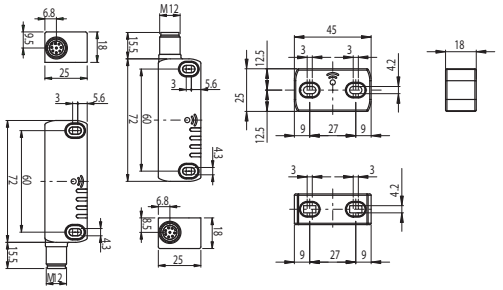
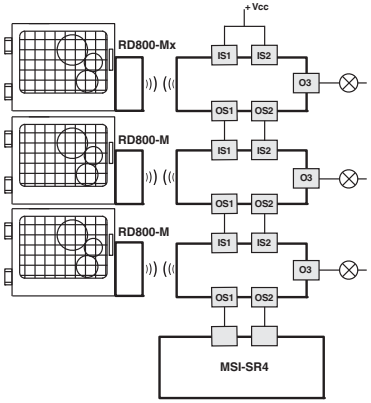


Figure 7: Series connection with RD800-Mx



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