Leuze

Translation of original operating instructions

RDH 142
RFID read/write device

The Sensor People

We reserve the right to make technical changes
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1 About this document

Tab. 1.1: Warning symbols and signal words

	Symbol indicating dangers to persons
	Symbol indicating possible property damage
NOTE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injuries Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.

Tab. 1.2: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbol for action steps Text passages with this symbol instruct you to perform actions.
	Symbol for action results Text passages with this symbol describe the result of the preceding action.

Tab. 1.3: Terms and abbreviations

AFI	Application Family Identifier 1-byte memory area that specifies the transponder's application area, e.g. medical, transportation, etc. The definition is given in ISO/IEC 15693-3.
CC	Capability Container Configuration memory, a specific memory area for NFC transponders
HF	High Frequency Radio frequency band on which data is transmitted between the read/write system and the transponder. Data is transmitted in accordance with ISO/IEC 15693 or ISO/IEC 14443 A worldwide on the 13.56 MHz frequency.
LSB	Least Significant Bit Bit with the lowest value
MSB	Most Significant Bit Bit with the highest value
RFID	Radio Frequency Identification Generic term for the contactless identification of objects equipped with transponders using radio waves.
PLC	Programmable Logic Control
UID	Unique identifier Unique, 64-bit transponder identification code. The UID is made up of the chip manufacturer number and the chip serial number.

2 Safety

This sensor was developed, manufactured and tested in line with the applicable safety standards. It corresponds to the state of the art.

2.1 Intended use

The RDH 100 and RDH 200 series RFID read/write systems are electronic devices for inductive data transmission to/from compatible code and data carriers. Commonly known as transponders or tags, they use radio frequency identification. The term transponder is used throughout this document.

Areas of application

The devices are designed for the following areas of application:

- Object detection in storage and materials-handling applications
- Flexible material flow control in assembly lines and interlinked production cells
- Production control

⚠ CAUTION
Observe intended use! The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not complying with its intended use. ↳ Only operate the device in accordance with its intended use. ↳ Leuze electronic GmbH + Co. KG is not liable for damages caused by improper use. ↳ Read these operating instructions before commissioning the device. Knowledge of the operating instructions is an element of proper use.

NOTICE
Comply with conditions and regulations! ↳ Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.

2.2 Foreseeable misuse

Any use other than that defined under "Intended use" or which goes beyond that use is considered improper use.

In particular, use of the device is not permitted in the following cases:

- for medical purposes

NOTICE
Do not modify or otherwise interfere with the device! ↳ Do not carry out modifications or otherwise interfere with the device. The device must not be tampered with and must not be changed in any way. ↳ Repairs must only be performed by Leuze electronic GmbH + Co. KG.

2.3 Competent persons

Connection, mounting, commissioning and adjustment of the device must only be carried out by competent persons.

Prerequisites for competent persons:

- They have a suitable technical education.
- They are familiar with the rules and regulations for occupational safety and safety at work.
- They are familiar with the operating instructions for the device.
- They have been instructed by the responsible person on the mounting and operation of the device.

Certified electricians

Electrical work must be carried out by a certified electrician.

Due to their technical training, knowledge and experience as well as their familiarity with relevant standards and regulations, certified electricians are able to perform work on electrical systems and independently detect possible dangers.

In Germany, certified electricians must fulfill the requirements of accident-prevention regulations DGUV (German Social Accident Insurance) provision 3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Disclaimer

Leuze electronic GmbH + Co. KG is not liable in the following cases:

- The device is not being used properly.
- Reasonably foreseeable misuse is not taken into account.
- Mounting and electrical connection are not properly performed.
- Changes (e.g., constructional) are made to the device.

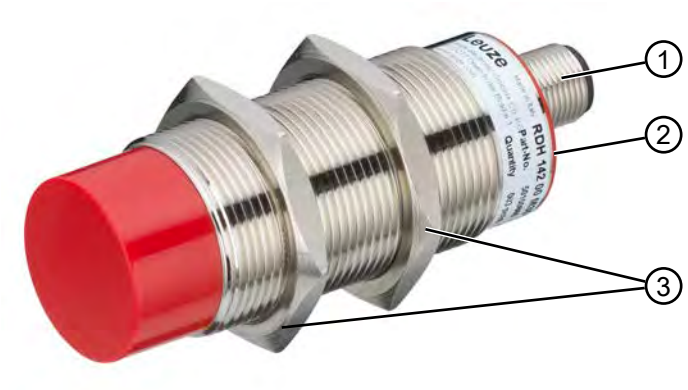
3 Device description

The RDH 100 and RDH 200 series RFID read/write systems are industrial-grade devices that operate in the HF frequency band at 13.56 MHz. They have an integrated decoder for the identification of common transponders (data carriers) in accordance with ISO/IEC 15693, ISO 14443 A and NFC Forum Type 2, 5.

In general, the RDH 142 RFID device is designed for applications in conveyor technology and production control with operating ranges of up to 6 cm. The device is configured using an IODD or an IO-Link master's web server, allowing it to adapt to a wide range of reading tasks. The readable distance depends on the individual environmental conditions and the transponder types used.

The devices have an integrated IO-Link interface for direct connection to IO-Link master devices.

3.1 Device overview



1 Connection
2 LED indicator (concealed on the rear side)
3 Fastening nuts

Fig. 3.1: RDH 142 RFID read/write system

3.2 Performance characteristics

- Reliable detection thanks to very homogeneous electromagnetic field
- Large beam spread (hemispherical shape), thus large reading field
- Compatible with HF transponders in accordance with ISO 15693 and ISO 14443 A
- Compact design, optimized for the operating range
- Safe detection of the transponder when stationary and in motion. Transponder can be written to and read when stationary (static) and in motion (dynamic).
- Visualization of operating states via LED
- Heavy-duty housing with protection class IP 67
- Can be used at temperatures down to -32°C, ideal for deep-freeze storage applications
- IO-Link interface
- Configurable via IODD or IO-Link master's web server

3.3 Device connection

The device connection is an M12 connector, 5-pin, A-coded with the functions:

- IO link
- PWR

3.4 Display elements

The device has an LED indicator that displays the device's operating status.

Tab. 3.1: LED indicator

Display	Meaning
Red, continuous light	Error / initialization
Green, continuous light	Ready for operation / antenna not active
Yellow, flashing, 4 Hz	Antenna active / transponder detected
Yellow, continuous light	Antenna active / no transponder detected
Off	No power supply / hardware defective

4 Functions

RFID devices with a working frequency of 13.56 MHz (HF) form a club-shaped, homogeneous electromagnetic field around the antenna. The operating range varies depending on the device type. The version of the transponder used also has a significant influence. The front of the device (red surface or active side, equipped with LED) must not be enclosed in metal. A metal surface in the reading field also reduces the operating range.

The device can be mounted directly on metallic surfaces. Depending on the installation situation, a slight reduction in the reading distance is then possible.

	NOTICE
	The antenna surfaces of the transponder and the read/write system should be aligned as parallel to each other as possible at the read/write position.

In principle, the detection range can be weakened by metallic structures in the vicinity of the transponder or the RDH housing, thus impairing its function. For this reason, we recommend the use of a metal-free spacer for standard transponders and metallic surfaces (e.g. Spacer 50 HT suitable for disk transponders with a diameter of 50 mm), whereby a 10 mm spacer height is sufficient for a operating range of approx. 50 mm.

For RFID read/write systems, it is recommended to keep the entire front area and an area on the side the size of “device dimensions + half the operating range” completely free of metal in order to be able to use the optimum performance (reading speed and operating range). If, for structural reasons, the device must be largely enclosed by a metallic surface, the metallic surface should have a slot on one side to interrupt the metallic short circuit for the detection field. This enables acceptable functionality and operating range even in metal.

With a dynamic read or write process, please note that the read and write speed depends on the amount of data to be read or written. The more data that needs to be read or written, the slower the RFID transponder’s movement should be. It is advisable to test the read or write process in motion in advance before productive use.

5 Applications

Identification of containers on a conveyor line

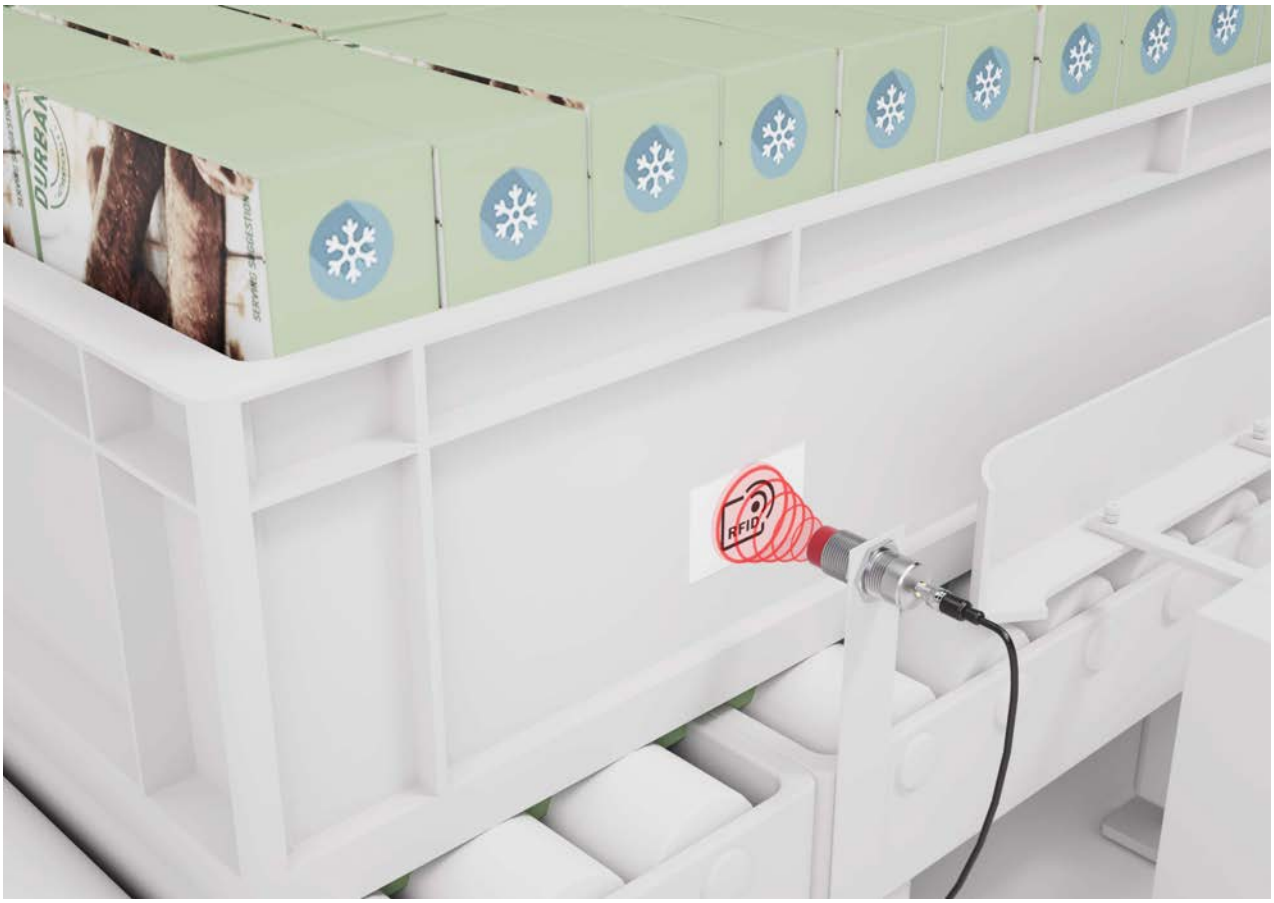


Fig. 5.1: Identification of containers on a conveyor line

Production control in production cells

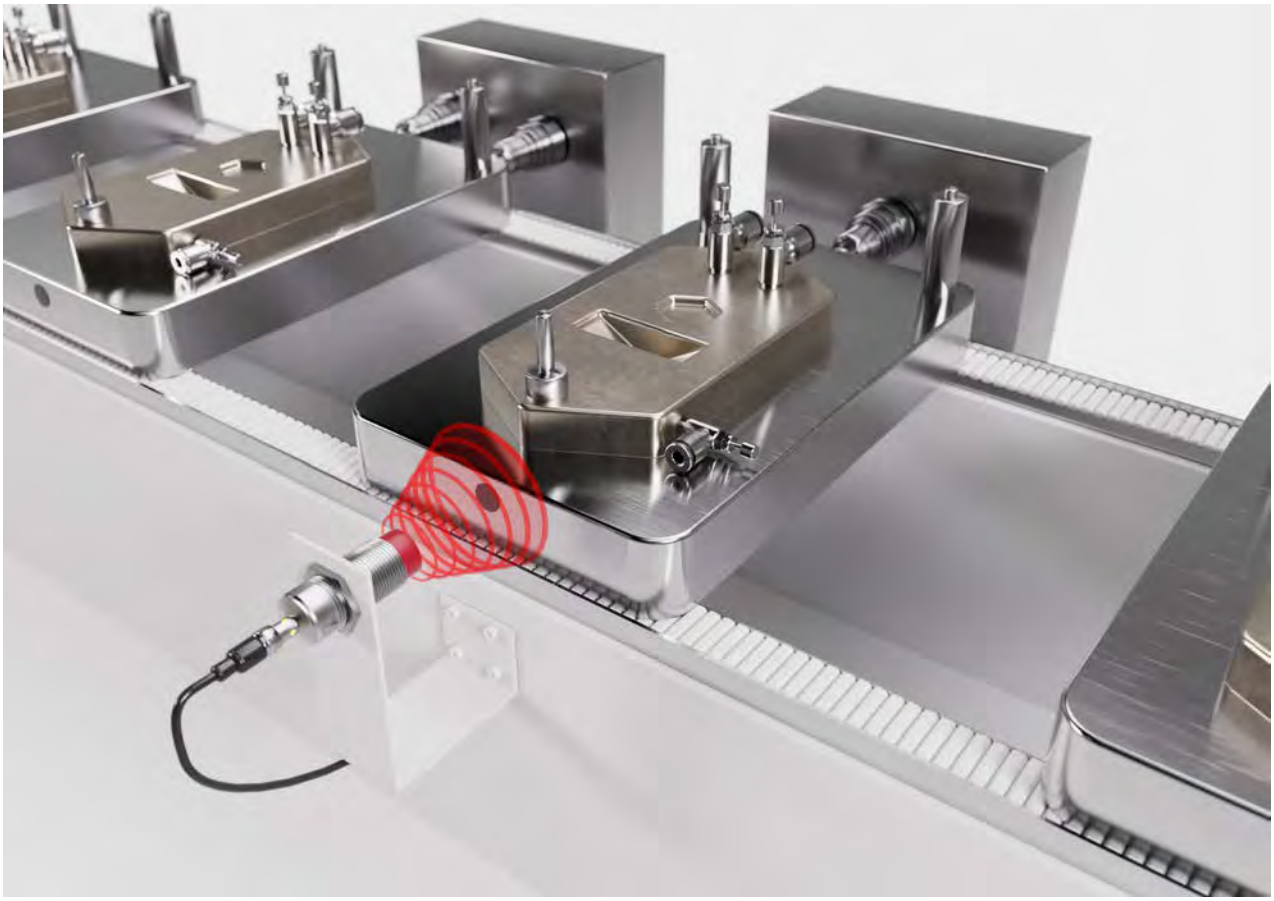


Fig. 5.2: Production control of workpiece carriers

User authentication at machines

Fig. 5.3: User authentication at machines

6 Mounting

6.1 Selecting a mounting location

Environmental conditions

Keep the device away from

- direct sunlight
- high air humidity
- extreme temperatures
- sources of electromagnetic disturbance

Any combination of these conditions may impair the device's performance or shorten its lifespan.

Mounting location

Consider the following factors:

- Size, parallel alignment to the RFID read/write system, and the transponder's position tolerance on the object to be detected.
- The minimum and maximum reading distances resulting from the devices' reading field are transponder-dependent.
- The reading point should be as free of metal as possible or at a defined distance from the metal. If you install a device close to or on metal, the read and write distance may be reduced.
- The transponder temperature at the reading point must be within the operating temperature range.
- The distance between two neighboring devices should be twice as large as the maximum operating range to avoid interference.
- The distance between the RFID read/write system and the host system with regard to the interface's permitted cable length.

The best read results are obtained

- if the transponder passes over the center of the antenna (device center) with an angular deviation of less than ±10 ... 15° to parallelism.
- if the transponder's temperature at the reading point is below 60°C and the transponder is not wet.
- if the reading distance is in the middle of the maximum possible reading field.
- if a single isolated transponder passes the device.

Reading range

The device generates a modulated electromagnetic field with a frequency of 13.56 MHz. The RFID antenna is integrated inside the housing.

An RFID system's reading range always depends on various factors, e. g,

- antenna size
- transponder size
- transponder IC type (sensitivity of the transponder)
- alignment between transponder and reading antenna
- position of the transponder relative to the reading antenna
- ambient noise due to external electromagnetic influences
- metallic environment

For this reason, all information on the reading range can only be typical values measured under laboratory conditions. In real applications, the reading range may deviate from the data specified in the data sheet.

Recommended distances

Tab. 6.1: Detection range

Read head distance to front	<60 mm, based on a 50x50 mm label tag, IC NXP ICODE SLIX2
Read head distance to side	<60 mm, based on a 50x50 mm label tag, IC NXP ICODE SLIX2

Interferences

To avoid interference with data communication, no other devices that emit interference in this frequency band may be operated in the vicinity of the RFID read/write system. Such devices include frequency inverters and switching power supply units.

- If there are other devices in the same frequency band in the vicinity, the mounting distances between the devices should be as large as possible.
- Use the devices in alternating operation.
- Switch the device's HF field on/off.

6.2 Mounting the RFID read/write system

Device and mounting dimensions see chapter 11.2 "Dimensions".

↳ Use the nuts supplied to fasten the device to a plastic or metal plate with a tightening torque of 30-40 Nm.

7 Electrical connection

CAUTION

- Before connecting the device, be sure that the supply voltage agrees with the value printed on the name plate.
- Only allow competent persons to perform the electrical connection.
- If faults cannot be rectified, take the device out of operation. Protect the device from accidentally being started.

CAUTION

UL applications!

For UL applications, use is only permitted in Class 2 circuits in accordance with the NEC (National Electric Code).

NOTICE

Protective Extra Low Voltage (PELV)!

The device is designed in accordance with protection class III for supply with PELV (Protective Extra-Low Voltage).

NOTICE

Protection class IP67

Protection class IP67 is achieved only if the connectors are screwed into place and caps installed.

NOTICE

The device is always active.

- Install a main switch between the power supply and the device to switch the device off if necessary.

The RFID read/write systems of the RDH 100 and RDH 200 series are equipped with an M12 connector.

- Connect the device with a suitable connection cable.
- Tighten the connector with a torque of 0.29-0.39 Nm.
- Supply the device with power via a suitable external power supply unit.

Suitable accessories see chapter 12 "Order guide and accessories".

NOTICE

To ensure trouble-free operation, the device must be connected to an external voltage-free earth potential.

7.1 Pin assignment

The connection designed as a 5-pin M12 connector (A-coded). This connector is shared with the IO-Link interface. This connection provides the power supply and the IO-Link interface.

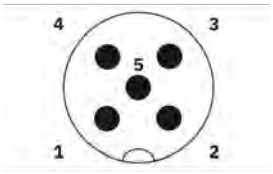


Fig. 7.1: 5-pin M12 connector, A-coded

Tab. 7.1: Pin assignment

Pin	Designation	Assignment	Core color
1	VCC	Supply voltage	Brown
2	DI/DO	Not used	White
3	GND	DC power supply return line	Blue
4	C/Q	IO link	Black
5	NC	Not connected	Gray

7.2 Cable lengths and shielding

The maximum cable length for RFID read/write systems with an IO-Link interface is 20 m. No shielding required.

8 Starting up the device

↳ Supply the device with power via a suitable external power supply unit.

⇨ As soon as the device is supplied with power, the boot sequence begins. This sequence is normally completed within 5 seconds. The device only accepts commands once the boot sequence has been completed.

↳ Configure the device via the IO-Link interface.

8.1 Configuration via IO-Link interface

The device is configured using the IODD or the connected IO-Link master's web server.

8.2 IO-Link interface

The IO-Link interface is available in accordance with specification 1.1.4 on pin 4. You can easily, quickly and economically configure the devices via the IO-Link interface. Furthermore, the sensor transmits the process data via the IO-Link interface and makes diagnostic information available through it.

8.2.1 IO-Link identification

Tab. 8.1: IO-Link identification

VendorID dec/hex	DeviceID dec/hex	Device
338/0x152	50150660/0x2FD3D04	RDH 142 00 M30
	50150662/0x2FD3D06	RDH 242 00

8.2.2 IO-Link process data

Input data (PDOut - 8-bit data length)

Sub-index	Bit offset	Data type	Value range	Default value	Name	Description
1	0	Boolean			Deactivate reader	Activating/deactivating the RF field

Byte 0

Bit offset	7	6	5	4	3	2	1	0
Sub-index	x	x	x	x	x	x	x	1

Output data (PDIn) – 80 bit data length

Sub-index	Bit offset	Data type	Value range	Default value	Name	Description
1	16	64-bit Uinteger			UID	Activating/deactivating the RF field
2	8	4-bit UInteger			Transponder type	Transponder type of the transponder in the detection range
3	0	2-bit UInteger	0 = no signal 1 = bad 2 = good		Transponder signal quality	Transponder signal quality in the detection range
4	2	Boolean			Error during automatic reading or writing	Error during automatic reading or writing

Sub-index	Bit offset	Data type	Value range	Default value	Name	Description
5	4	4-bit UInteger	0 = no transponder, 1 ... 15		Short ID	ID transmitted to transponder in detection range

Byte 0

Bit offset	79	78	77	76	75	74	73	72
Sub-index	1							

Byte 1

Bit offset	71	70	69	68	67	66	65	64
Sub-index	1							

Byte 2

Bit offset	63	62	61	60	59	58	57	56
Sub-index	1							

Byte 3

Bit offset	55	54	53	52	51	50	49	48
Sub-index	1							

Byte 4

Bit offset	47	46	45	44	43	42	41	40
Sub-index	1							

Byte 5

Bit offset	39	38	37	36	35	34	33	32
Sub-index	1							

Byte 6

Bit offset	31	30	29	28	27	26	25	24
Sub-index	1							

Byte 7

Bit offset	23	22	21	20	19	18	17	16
Sub-index	1							

Byte 8

Bit offset	15	14	13	12	11	10	9	8
Sub-index	x	x	x	x	2			

Byte 9

Bit offset	7	6	5	4	3	2	1	0
Sub-index	5				x	4	3	

8.2.3 Device-specific IODD

At **www.leuze.com** in the download area for IO-Link sensors you will find the IODD zip file with all files required for the installation.

On the IODDfinder platform (https://ioddfinder.io-link.com/), a central cross-manufacturer database, you can also find the description files (IODDs) of the IO-Link sensors.

8.2.4 IO-Link parameters documentation

The complete description of the IO-Link parameters can be found in the *.html files. Double-click on a language variant in the directory containing the extracted files:

- German: *IODD*-de.html
- English: *IODD*-en.html

If the html file within the ZIP archive is opened, the image files are not displayed.

↳ Extract the ZIP file first.

8.2.5 IO-Link parameters

The descriptions of the configurable parameters of the device are below.

Parameter	Description
Data retention time	Time in ms in which the input process data can be kept constant.
Activate transponder type	Device activation for each transponder type. Individual bits are intended to activate (1, true) or deactivate (0, false) functions: • Bit 0: NXP ICODE 1 • Bit 1: ISO 15693 • Bit 2: ISO 14443 A • Bit 3: ISO 14443 B* • Bit 4: not used • Bit 5: not used • Bit 6: not used • Bit 7: not used
Activate AFI filter mode	Device activation for the AFI filter: • 0, false: Deactivated • 1, true: Activated This parameter must be used in combination with the AFI code parameter. The AFI filter is a selection criterion for the ISO 15693 transponder in this application. The transponder can only be read or written to if the AFI on the transponder and the data stored in this register match.
AFI code	AFI code (Application Family Identifier) This parameter must be used in combination with the parameter *Activate AFI filter operation*. The AFI filter is a selection criterion for the ISO 15693 transponder in this application. The transponder can only be read or written to if the AFI on the transponder and the data stored in this register match.
Memory read or write specification	Specification of the memory read or write process for the *Automatic read* or *Automatic write* operating modes: • Address: Address of the first byte to be read from or written to the transponder. • Length: Number of bytes to be read from or written to the transponder. In the *Automatic read* and *Automatic write* operating modes, the device automatically reads and writes the specified amount of data from and to the transponder. The read process is carried out using the transfer buffers for reading out the memory. The write process is carried out using the transfer buffers for writing to the memory.

Parameter	Description
Automatically read or write memory	Device activation for the *Automatic read* or *Automatic write* operating modes: • 0: Deactivated • 1: Automatic write • 2: Automatic read In the *Automatic read* and *Automatic write* operating modes, the device automatically reads and writes the specified amount of data from and to the transponder. The read process is carried out using the transfer buffers for reading out the memory. The write process is carried out using the transfer buffers for writing to the memory.
Memory read buffer	The memory area of the transponder is read in *Automatic read* operating mode with the specified memory start address and length. This is a fixed parameter with a length of 232 bytes, whereby bytes that are not required are filled with 0. If the address and length do not match the transponder's block size, the area outside is filled with 0.
Memory write buffer	The transponder's memory area to be written to is written to in *Automatic write* operating mode with the specified memory start address and length. This is a fixed parameter with a length of 232 bytes, whereby bytes that are not required are not written. If the address and length do not match the transponder's block size, the area outside is filled with 0.
Memory read buffer 1	The memory area of the transponder is read in *Automatic read* operating mode with the specified memory start address and length. This is not included in IODD. A variable length (up to 232 bytes) can be used here by PC applications or PLCs. This improves performance and only the required data needs to be transferred.
Memory write buffer 1	The transponder's memory area to be written to is written to in *Automatic write* operating mode with the specified memory start address and length. This is not included in IODD. A variable length (up to 232 bytes) can be used here by PC applications or PLCs. This improves performance and only the required data needs to be transferred.
Short ID 1 Teach value	If a UID has been transferred to the memory location of a short ID 1, the short ID 1 is displayed in the process data if the associated UID has been detected: • 0: not specified • 1...4294967295: UID setting
…	…
Short ID 15 Teach value	If a UID has been transferred to a short ID 15 memory location, the short ID 15 is displayed in the process data if the associated UID has been detected: • 0: not specified • 1...4294967295: UID setting

Details of the configurable parameters of the device are below.

Parameter	Index	Sub-index	Data type	Access	Value range	Default
Data retention time	64	0	16-bit UInteger	RW	1000 … 60000	1000
Activate transponder type – NXP ICODE 1	65	1	Boolean	RW	True, false	true
Activate transponder type – ISO 15693	65	2	Boolean	RW	True, false	true

Parameter	Index	Sub-index	Data type	Access	Value range	Default
Activate transponder type – ISO 14443 A	65	3	Boolean	RW	True, false	true
Activate transponder type – ISO 14443 B*	65	4	Boolean	RW	True, false	true
Activate AFI filter mode	66	0	Boolean	RW	True, false	false
AFI code	67	0	8-bit UInteger	RW	0 … 255	0
Memory read or write specification – address	80	1	16-bit UInteger	RW	0 … 8191	0
Memory read or write specification – length	80	2	8-bit UInteger	RW	0 … 232	0
Automatically read or write memory	81	0	8-bit UInteger	RW	0, 1, 2	0
Memory read buffer	82	0	232-octet Octet-String	RO		
Memory write buffer	83	0	232-octet Octet-String	WO		
Memory read buffer 1	90	0	-	RO		
Memory write buffer 1	91	0	-	WO		
Short ID 1 Teach value	100	0	64-bit Uinteger	RW	0, 1 … 4294967295	0
…						
Short ID 15 Teach value	114	0	64-bit Uinteger	RW	0, 1 … 4294967295	0

* ISO 14443 B transponder management is not implemented in the current version.

8.3 Device operation

The device supports several operating modes:

- Read UID
- Automatic read
- Automatic writing

Deactivate internal antenna

The device's RF field can be deactivated at any time. With the RF field deactivated:

- the device can still be addressed via IO-Link,
- no FF field is generated by the device,
- the device does not detect any transponders.

To deactivate the internal antenna, set the *Deactivate reader* bit in the process data output.

Read UID operating mode

In *Read UID* operating mode, the UID of a transponder is read. The UID is then available in the process data input. If there is no transponder within the device's operating range, the data is filled with the value 0x00.

For UIDs with a data length < 8 bytes, the remaining data is filled with the value 0x00.

The data in the process image is updated as soon as a transponder enters the detection range. If the transponder leaves the detection range, the data is retained in the process image according to the data retention time. If the data retention time is exceeded and there is no transponder in the detection range, the data is filled with the value 0x00.

	NOTICE
	The default operating mode after starting the device is *Read UID*.

Automatic read operating mode

In *Automatic read* operating mode, a transponder's memory area is read out. The memory area is then available in the *Memory read buffer* and/or *Memory read buffer 1* parameters. The address and length of the memory area are defined by the parameter *Memory read or write specification*. If the read was not successful, the error value is displayed in the process image.

For memory areas with a data length < 232 bytes, the data remaining in the *Memory read buffer* parameter is filled with the value 0x00.

To activate the *Automatic read* operating mode correctly, a few steps must be followed:

- Define the address of the first byte to be read from the transponder by setting the parameter *Memory read or write specification – address* (index = 80, subindex = 1).
- Define the number of bytes to be read from the transponder by setting the parameter *Memory read or write specification – length* (index = 80, subindex = 2).
- Activate the *Automatic read* operating mode by setting the parameter *Automatically read or write memory* (index = 81) to 2.

Automatic write operating mode

In *Automatic write* operating mode, a transponder's memory area is written to. The memory area is set in the parameters *Memory write buffer* and/or *Memory write buffer 1*. The address and length of the memory area are defined by the *Memory read or write specification* parameters. If writing was not successful, the error value is displayed in the process image.

For memory areas with a data length < 232 bytes, the data remaining in the *Memory write buffer* parameter is filled with the value 0x00.

To activate the *Automatic write* operating mode correctly, a few steps must be followed:

- Define the address of the first byte to be written to the transponder by setting the parameter *Memory read or write specification – address* (index = 80, subindex = 1).
- Define the number of bytes to be written to the transponder by setting the parameter *Memory read or write specification – length* (index = 80, subindex = 2).
- Define the data to be written to the transponder by setting the *Memory write buffer* parameter (index = 83).
- Activate the *Automatic write* operating mode by setting the parameter *Automatically read or write memory* (index = 81) to 1.

9 Care, maintenance and disposal

The RDH 100 and RDH 200 series RFID read/write systems do not require any maintenance by the operating company.

Maintenance

Clean the device with a cloth if it is dirty. Interference can only be caused by metallic dust or liquid pooling on the device.

NOTICE	
	**Do not use aggressive cleaning agents!** ↳ Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device.

Repairs

Repairs may only be carried out by the manufacturer, see chapter 10 "Service and support".

Disposing

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

10 Service and support

Service hotline

You can find the contact information for the hotline in your country on our website **www.leuze.com** under **Contact & Support**.

Repair service and returns

Defective devices are repaired in our service centers competently and quickly. We offer you an extensive service packet to keep any system downtimes to a minimum. Our service center requires the following information:

- Your customer number
- Product description or part description
- Serial number or batch number
- Reason for requesting support together with a description

Please register the merchandise concerned. Simply register return of the merchandise on our website **www.leuze.com** under **Contact & Support > Repair Service & Returns**.

To ensure quick and easy processing of your request, we will send you a returns order with the returns address in digital form.

11 Technical data

11.1 General specifications

Tab. 11.1: Basic data

Working frequency	13.56 MHz

Tab. 11.2: Read data

Reading/writing range, max.	60 mm
Transponder, readable	ISO/IEC 14443 A ISO/IEC 15693 NFC Types 2, 5

Tab. 11.3: Electrical data

Supply voltage U_B	24 ± 6 V DC
Power consumption, max.	1 W
Memory access	Read/Write
Number of digital switching inputs	1x
Number of digital switching outputs	1x

Tab. 11.4: Connection

Number of connections	1x
Function	I/O IO link PWR
Type of connection	Connector
Thread size	M12

Tab. 11.5: Mechanical data

Design	Cylindrical
Length	75 mm
Thread size	M30
Housing material	Plastic/metal
Net weight	120 g
Housing color	Red/silver
Type of fastening	Mounting thread

Tab. 11.6: Environmental data

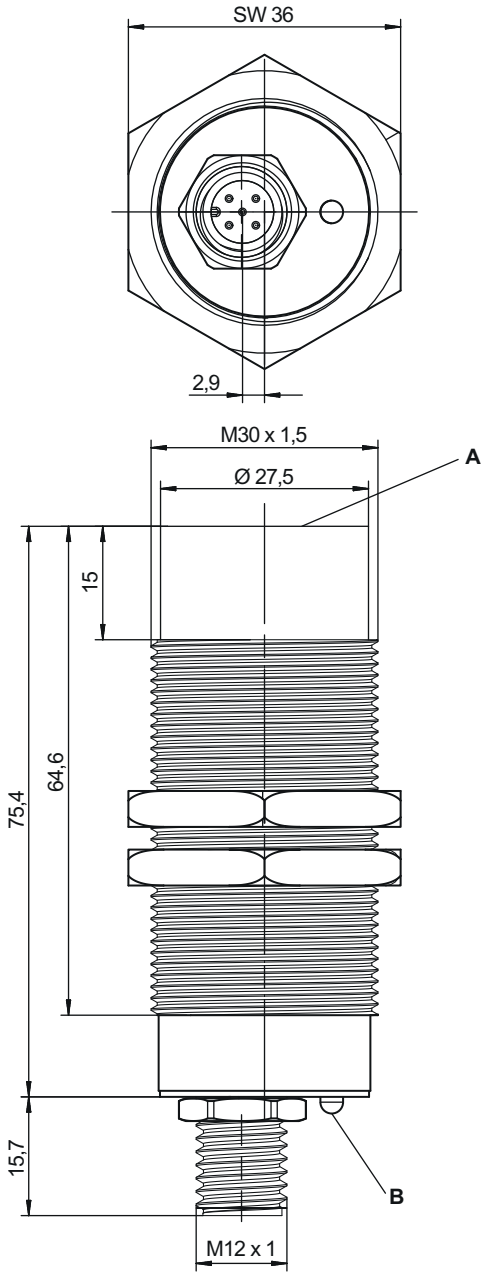
Ambient temperature, operation	-32 … 60°C
Ambient temperature, storage	-40 … 85°C
Relative humidity (non-condensing)	0 … 90%

Tab. 11.7: Certifications

Protection class	IP67

Certifications	EU

11.2 Dimensions



All dimensions in mm

A Active surface

B LED indicator

Fig. 11.1: RSL 142 dimensions

12 Order guide and accessories

RFID read/write systems

Tab. 12.1: Type overview

Part no.	Article	Description
50150660	RDH 142 00 M30	RFID read/write system with IO-Link interface

NOTICE
A list of all available device types and suitable accessories can be found on the product page of the Leuze website **www.leuze.com**.

13 Declaration of Conformity

The RDH series' RFID read/write systems, including the associated TFM and RTH transponders, have been developed and manufactured in compliance with applicable European standards and directives.

	NOTICE
	You can download the EC Declaration of Conformity from the Leuze website. ↳ Call up the Leuze website: *www.leuze.com*. ↳ Enter the type designation or part number of the device as the search term. The article number can be found on the name plate of the device under the entry "Part. No.". ↳ The documents can be found on the product page for the device under the *Downloads* tab.

14 Appendix

14.1 Transponder specific information

14.1.1 NXP I-CODE 1 memory organization

Tab. 14.1: NXP I-CODE 1 memory organization

Block	Byte 0	Byte 1	Byte 2	Byte 3	Description
0	SNR0	SNR1	SNR2	SNR3	Serial number (low)
1	SNR4	SNR5	SNR6	SNR7	Serial number (high)
2	F0	FF	FF	FF	Write access
3	x	x	x	x	Special functions
4	x	x	x	x	Filter code / app ID / user data
5	x	x	x	x	User data
6	x	x	x	x	User data
…	…	…	…	…	…
14	x	x	x	x	User data
15	x	x	x	x	User data

14.1.2 NXP I-CODE SLI memory organization

Tab. 14.2: NXP I-CODE SLI memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
26	32	User data
27	32	User data

Unique serial number (UID) NXP I-CODE SLI

Tab. 14.3: Unique serial number (UID) NXP I-CODE SLI

64	57	56	49	48	41	40									1
E0		04		01		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

Bits 37 and 36 are programmed to ‘00’ to distinguish them from the other I-CODE transponder types.

14.1.3 NXP I-CODE SLI-S memory organization

Tab. 14.4: NXP I-CODE SLI-S memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
38	32	User data
39	32	User data

Unique serial number (UID) NXP I-CODE SLI-S

Tab. 14.5: Unique serial number (UID) NXP I-CODE SLI-S

64	57	56	49	48	41	40									1
E0		04		02		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

Bits 37 and 36 are programmed to ‘00’ to distinguish them from the other I-CODE transponder types.

14.1.4 NXP I-CODE SLI-L memory organization

Tab. 14.6: NXP I-CODE SLI-L memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
7	32	User data
8	32	User data

Unique serial number (UID) NXP I-CODE SLI-L

Tab. 14.7: Unique serial number (UID) NXP I-CODE SLI-L

64	57	56	49	48	41	40									1
E0		04		03		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

Bits 37 and 36 are programmed to ‘00’ to distinguish them from the other I-CODE transponder types.

14.1.5 NXP I-CODE SLIX memory organization

Tab. 14.8: NXP I-CODE SLIX memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
26	32	User data
27	32	User data

Unique serial number (UID) NXP I-CODE SLIX

Tab. 14.9: Unique serial number (UID) NXP I-CODE SLIX

64	57	56	49	48	41	40									1
E0		04		01		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

Bits 37 and 36 are programmed to ‘10’ to distinguish them from the other I-CODE transponder types.

14.1.6 NXP I-CODE SLIX-S memory organization

Tab. 14.10: NXP I-CODE SLIX-S memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
38	32	User data
39	32	User data

Unique serial number (UID) NXP I-CODE SLIX-S

Tab. 14.11: Unique serial number (UID) NXP I-CODE SLIX-S

64	57	56	49	48	41	40									1
E0		04		02		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

Bits 37 and 36 are programmed to ‘10’ to distinguish them from the other I-CODE transponder types.

14.1.7 NXP I-CODE SLIX-L memory organization

Tab. 14.12: NXP I-CODE SLIX-L memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
6	32	User data
7	32	User data

Unique serial number (UID) NXP I-CODE SLIX-L

Tab. 14.13: Unique serial number (UID) NXP I-CODE SLIX-L

64	57	56	49	48	41	40									1
E0		04		03		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

Bits 37 and 36 are programmed to ‘10’ to distinguish them from the other I-CODE transponder types.

14.1.8 NXP I-CODE SLIX2 memory organization

Tab. 14.14: NXP I-CODE SLIX2 memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
77	32	User data
78	32	User data
79	32	Counter

Unique serial number (UID) NXP I-CODE SLIX2

Tab. 14.15: Unique serial number (UID) NXP I-CODE SLIX2

64	57	56	49	48	41	40									1
E0		04		03		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

Bits 37 and 36 are programmed to ‘01’ to distinguish them from the other I-CODE transponder types.

14.1.9 TI Tag-it HF-I Standard memory organization

Tab. 14.16: TI Tag-it HF-I Standard memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data

Block	Bits	Description
…	…	…
6	32	User data
7	32	User data

Unique serial number (UID) TI Tag-it HF-I Standard

Tab. 14.17: Unique serial number (UID) TI Tag-it HF-I Standard

64	57	56	49	48	41	40									1
E0		07		C0 / C1		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.10 TI Tag-it HF-I Plus memory organization

Tab. 14.18: TI Tag-it HF-I Plus memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
62	32	User data
63	32	User data

Unique serial number (UID) TI Tag-it HF-I Plus

Tab. 14.19: Unique serial number (UID) TI Tag-it HF-I Plus

64	57	56	49	48	41	40									1
E0		07		00 / 01 / 80 / 81		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.11 TI Tag-it HF-I Pro memory organization

Tab. 14.20: TI Tag-it HF-I Pro memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
6	32	User data
7	32	User data

Unique serial number (UID) TI Tag-it HF-I Pro

Tab. 14.21: Unique serial number (UID) TI Tag-it HF-I Pro

64	57	56	49	48	41	40									1
E0		07		C4 / C5		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.12 STM LRI 512 memory organization

Tab. 14.22: STM LRI 512 memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
14	32	User data
15	32	User data

Unique serial number (UID) STM LRI 512

Tab. 14.23: Unique serial number (UID) STM LRI 512

64	57	56	49	48											1
E0		02		IC manufacturer serial number											
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.13 Infineon my-d (02P) memory organization

Tab. 14.24: Infineon my-d (02P) memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
54	32	User data
55	32	User data

Unique serial number (UID) Infineon my-d (02P)

Tab. 14.25: Unique serial number (UID) Infineon my-d (02P)

64	57	56	49	48	41	40									1
E0		05		40		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.14 Infineon my-d (10P) memory organization

Tab. 14.26: Infineon my-d (10P) memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	32	User data
1	32	User data
…	…	…
246	32	User data
247	32	User data

Unique serial number (UID) Infineon my-d (10P)

Tab. 14.27: Unique serial number (UID) Infineon my-d (10P)

64	57	56	49	48	41	40									1
E0		05		00		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.15 EM EM4135 memory organization

Tab. 14.28: EM EM4135 memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
13	64	User data
14	64	User data
…	…	…
47	64	User data
48	64	User data

Unique serial number (UID) EM EM4135

Tab. 14.29: Unique serial number (UID) EM EM4135

64	57	56	49	48											1
E0		16		IC manufacturer serial number											
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.16 Fujitsu MB89R118C memory organization

Tab. 14.30: Fujitsu MB89R118C memory organization

Block	Bits	Description
UID	64	Unchangeable serial number
0	64	User data
1	64	User data
…	…	…
248	64	User data
249	64	User data

Unique serial number (UID) Fujitsu MB89R118C

Tab. 14.31: Unique serial number (UID) Fujitsu MB89R118C

64	57	56	49	48	41	40									1
E0		08		01		IC manufacturer serial number									
UID 7		UID 6		UID 5		UID 4		UID 3		UID 2		UID 1		UID 0	

14.1.17 NXP MIFARE Classic 1k memory organization

Tab. 14.32: NXP MIFARE Classic 1k memory organization

Sector	Block	Bits	Description
0	0	128	Manufacturer block
	1	128	User data
	2	128	User data
	3	128	Sector trailer (last block)
1	0	128	User data
	1	128	User data
	2	128	User data
	3	128	Sector trailer (last block)
	…	…	…
15	0	128	User data
	1	128	User data
	2	128	User data
	3	128	Sector trailer (last block)

14.1.18 NXP MIFARE Classic 4k memory organization

Tab. 14.33: NXP MIFARE Classic 4k memory organization

Sector	Block	Bits	Description
0	0	128	Manufacturer block
	1	128	User data
	2	128	User data
	3	128	Sector trailer (last block)
…	…	…	…
31	0	128	User data
	1	128	User data
	2	128	User data
	3	128	Sector trailer (last block)

Sector	Block	Bits	Description
32	0	128	User data
	1	128	User data
	2	128	User data
	3	128	User data
	…	…	…
	13	128	User data
	14	128	User data
	15	128	Sector trailer (last block)
…	…	…	…
39	0	128	User data
	1	128	User data
	2	128	User data
	3	128	User data
	…	…	…
	13	128	User data
	14	128	User data
	15	128	Sector trailer (last block)

NXP MIFARE Classic 1k / 4k manufacturer block

Tab. 14.34: NXP MIFARE Classic 1k / 4k manufacturer block

128 – 49	48 – 1
Manufacturer data	UID (32 bit if NUID)

NXP MIFARE Classic 1k / 4k sector trailer (last block)

Tab. 14.35: NXP MIFARE Classic 1k / 4k sector trailer (last block)

128 – 81	80 – 49	48 – 1
Key B (optional)	Access bits	UID (32 bit if NUID)

14.1.19 NXP MIFARE Ultralight C memory organization

Tab. 14.36: NXP MIFARE Ultralight C memory organization

Page	Byte	Bits	Description
0	0 – 3	32	Serial number
1	0 – 3	32	Serial number
2	0	8	Serial number
	1	8	Internal
	2 – 3	16 – 31	Lock bytes
3	0 – 3	32	Uniquely programmable
4	0 – 3	32	User memory
…	…	…	…
39	0 – 3	32	User memory

Page	Byte	Bits	Description
40	0 – 1	16	Lock bytes
	2 – 3	16	Reserved
41	0 – 1	16	16-bit counter
42	0 – 4	32	Authentication configuration
43	0 – 4	32	Authentication configuration
44	0 – 4	32	Authentication key
45	0 – 4	32	Authentication key
46	0 – 4	32	Authentication key
47	0 – 4	32	Authentication key

Unique serial number NXP MIFARE Ultralight C

Tab. 14.37: Unique serial number NXP MIFARE Ultralight C

Page	Byte 3	Byte 2	Byte 1	Byte 0
0	Check byte 0	Serial number part 1		
1	Serial number part 2			
2	Lock bytes		Internal	Check byte 1

14.1.20 NXP NTAG 210 memory organization

Tab. 14.38: NXP NTAG 210 memory organization

Page	Bytes	Bits	Description
0	0 – 3	32	Serial number
1	0 – 3	32	Serial number
2	0	8	Serial number
	1	8	Internal
	2 – 3	16	Lock bytes
3	0 – 3	32	Configuration memory (CC)
4	0 – 3	32	User memory
…		…	…
15	0 – 3	32	User memory
16	0 – 3	32	CFG 0 configuration page
17	0 – 3	32	CFG 1 configuration page
18	0 – 3	32	PWD configuration page
19	0 – 1	16	PACK configuration page
	2 – 3	16	RFUI configuration page

Unique serial number NXP NTAG 210

Tab. 14.39: Unique serial number NXP NTAG 210

Page	Byte 3	Byte 2	Byte 1	Byte 0
0	Check byte 0	Serial number part 1		
1	Serial number part 2			

Page	Byte 3	Byte 2	Byte 1	Byte 0
2	Lock bytes		Internal	Check byte 1

14.1.21 NXP NTAG 212 memory organization

Tab. 14.40: NXP NTAG 212 memory organization

Page	Bytes	Bits	Description
0	0 – 3	32	Serial number
1	0 – 3	32	Serial number
2	0	8	Serial number
	1	8	Internal
	2 – 3	16	Lock bytes
3	0 – 3	32	Configuration memory (CC)
4	0 – 3	32	User memory
…	…	…	…
35	0 – 3	32	User memory
36	0 – 2	24	Dynamic lock bytes
	3	8	RFUI dynamic lock bytes
37	0 – 3	32	CFG 0 configuration page
38	0 – 3	32	CFG 1 configuration page
39	0 – 3	32	PWD configuration page
40	0 – 1	16	PACK configuration page
	2 – 3	16	RFUI configuration page

Unique serial number NXP NTAG 212

Tab. 14.41: Unique serial number NXP NTAG 212

Page	Byte 3	Byte 2	Byte 1	Byte 0
0	Check byte 0	Serial number part 1		
1	Serial number part 2			
2	Lock bytes		Internal	Check byte 1

14.1.22 NXP NTAG 213 memory organization

Tab. 14.42: NXP NTAG 213 memory organization

Page	Bytes	Bits	Description
0	0 – 3	32	Serial number
1	0 – 3	32	Serial number
2	0	8	Serial number
	1	8	Internal
	2 – 3	16	Lock bytes
3	0 – 3	32	Configuration memory (CC)
4	0 – 3	32	User memory
…		…	…

Page	Bytes	Bits	Description
39	0 – 3	32	User memory
40	0 – 2	24	Dynamic lock bytes
	3	8	RFUI dynamic lock bytes
41	0 – 3	32	CFG 0 configuration page
42	0 – 3	32	CFG 1 configuration page
43	0 – 3	32	PWD configuration page
44	0 – 1	16	PACK configuration page
	2 – 3	16	RFUI configuration page

Unique serial number NXP NTAG 213

Tab. 14.43: Unique serial number NXP NTAG 213

Page	Byte 3	Byte 2	Byte 1	Byte 0
0	Check byte 0	Serial number part 1		
1	Serial number part 2			
2	Lock bytes		Internal	Check byte 1

14.1.23 NXP NTAG 215 memory organization

Tab. 14.44: NXP NTAG 215 memory organization

Page	Bytes	Bits	Description
0	0 – 3	32	Serial number
1	0 – 3	32	Serial number
2	0	8	Serial number
	1	8	Internal
	2 – 3	16	Lock bytes
3	0 – 3	32	Configuration memory (CC)
4	0 – 3	32	User memory
…		…	…
129	0 – 3	32	User memory
130	0 – 2	24	Dynamic lock bytes
	3	8	RFUI dynamic lock bytes
131	0 – 3	32	CFG 0 configuration page
132	0 – 3	32	CFG 1 configuration page
133	0 – 3	32	PWD configuration page
134	0 – 1	16	PACK configuration page
	2 – 3	16	RFUI configuration page

Unique serial number NXP NTAG 215

Tab. 14.45: Unique serial number NXP NTAG 215

Page	Byte 3	Byte 2	Byte 1	Byte 0
0	Check byte 0	Serial number part 1		

Page	Byte 3	Byte 2	Byte 1	Byte 0
1	Serial number part 2			
2	Lock bytes		Internal	Check byte 1

14.1.24 NXP NTAG 216 memory organization

Tab. 14.46: NXP NTAG 216 memory organization

Page	Bytes	Bits	Description
0	0 – 3	32	Serial number
1	0 – 3	32	Serial number
2	0	8	Serial number
	1	8	Internal
	2 – 3	16	Lock bytes
3	0 – 3	32	Configuration memory (CC)
4	0 – 3	32	User memory
…		…	…
225	0 – 3	32	User memory
226	0 – 2	24	Dynamic lock bytes
	3	8	RFUI dynamic lock bytes
227	0 – 3	32	CFG 0 configuration page
228	0 – 3	32	CFG 1 configuration page
229	0 – 3	32	PWD configuration page
230	0 – 1	16	PACK configuration page
	2 – 3	16	RFUI configuration page

Unique serial number NXP NTAG 216

Tab. 14.47: Unique serial number NXP NTAG 216

Pages	Byte 3	Byte 2	Byte 1	Byte 0
0	Check byte 0	Serial number part 1		
1	Serial number part 2			
2	Lock bytes		Internal	Check byte 1