

SIMATIC Ident

RFID systems SIMATIC RF1000

Operating Instructions

<u>Introduction</u>	1
<u>Description</u>	2
<u>Installation</u>	3
<u>Connecting</u>	4
<u>Installing and commissioning</u>	5
<u>Programming</u>	6
<u>The demo application</u>	7
<u>Technical specifications</u>	8
<u>Dimension drawing</u>	9
<u>Appendix</u>	A
<u>Service & Support</u>	B

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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Note the following:

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Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

1	Introduction	5
2	Description.....	7
2.1	Description of the readers	7
2.2	Connection options and supported transponders	9
3	Installation	11
4	Connecting	15
5	Installing and commissioning.....	19
6	Programming	21
6.1	Typical applications.....	21
6.2	Programming via USB interface	22
6.2.1	Functions of the DLL	22
6.2.1.1	brp_open_usb_session	22
6.2.1.2	brp_set_bufsize	23
6.2.1.3	brp_close_session.....	24
6.2.1.4	syscmd_reset.....	24
6.2.1.5	syscmd_get_info	25
6.2.1.6	syscmd_get_boot_status.....	26
6.2.1.7	syscmd_set_port.....	26
6.2.1.8	vhl_select	27
6.2.1.9	vhl_get_snr.....	29
6.2.1.10	vhl_is_selected.....	30
6.2.1.11	vhl_read	30
6.2.1.12	vhl_write	31
6.2.1.13	Autoread_SetMode	32
6.2.1.14	Autoread_GetMessage	34
6.2.1.15	Return values.....	35
6.3	Programming via the RS232 interface.....	36
6.3.1	Implementation of the system jobs	37
6.3.2	System jobs	37
6.3.2.1	syscmd_reset.....	37
6.3.2.2	syscmd_get_info	38
6.3.2.3	syscmd_get_boot_status.....	39
6.3.2.4	syscmd_set_port.....	39
6.3.2.5	vhl_select	40
6.3.2.6	vhl_get_snr.....	41
6.3.2.7	vhl_is_selected.....	42
6.3.2.8	vhl_read	43
6.3.2.9	vhl_write	44
6.3.2.10	Autoread_SetMode	46
6.3.2.11	Autoread_GetMessage	46
6.4	Status codes	48

7	The demo application.....	51
7.1	User interface of the demo application	51
7.2	Create your own PC application via the USB interface	54
8	Technical specifications	57
9	Dimension drawing	59
A	Appendix	61
A.1	Certificates & approvals	61
A.1.1	Country-specific approvals.....	61
A.1.2	Using the reader in hazardous areas.....	63
A.2	Ordering data	65
B	Service & Support.....	67

Introduction

Purpose of this document

This documentation provides you with an overview of the installation and programming of the SIMATIC RF1060R and RF1070R readers. The operating instructions are intended for users and programmers involved in configuration, commissioning and servicing of the SIMATIC RF1060R/RF1070R.

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Orientation in the documentation

The manuals of the relevant SIMATIC Ident products (e.g. SIMATIC RF170C) on the Siemens Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/ps/14970/man>) pages contain additional information on the devices specified in this document.

Recycling and disposal



The products are low in harmful substances, can be recycled and meet the requirements of the Directive 2012/19/EU for disposal of waste electrical and electronic equipment (WEEE).

Do not dispose of the products at public disposal sites.

For environmentally compliant recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste or your Siemens representative.

Note the different country-specific regulations.

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Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit

Link: (<http://www.siemens.com/industrialsecurity>)

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To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under

Link: (<http://www.siemens.com/industrialsecurity>)

Description

2.1 Description of the readers

Companies have been using RFID-based identification card systems for years to control access to buildings. With the increasing need for security and growing requirements for documentation, solutions are demanded with which access to machines and plants can be controlled on a user-specific basis. The SIMATIC RF1040R, RF1060R and RF1070R readers provide the option of using employee identification cards also when operating machines. This allows finely graded access concepts to be implemented or user-specific instructions to be stored - all with one card.



Figure 2-1 Product photo of the SIMATIC RF1040R, SIMATIC RF1060R and SIMATIC RF1070R readers

Reader-specific differences (interfaces)

The SIMATIC RF1000 readers are designed for connection to a Windows computer. The connection is via a USB interface of the computer. The SIMATIC RF1040R and RF1070R readers can also be connected to a Linux-based system over the RS232 interface.

Interface-specific programming

On the Siemens support page "Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/view/109741590>)" you will find functions for accessing the readers in form of DLL files as well as a demo application. With operation via the USB interface on a PC (Windows), you can implement user identification for access to your own applications quickly and simply with the help of the DLL file. To do this, the reader reads out the serial numbers of MIFARE, ISO 15693 and LEGIC transponders.

If the SIMATIC RF1040R/RF1070R readers are operated via the RS232 interface, communication takes place over the freeport protocol.

Application example

The following picture shows an example of an application of the SIMATIC RF1060R in conjunction with a SIMATIC HMI.

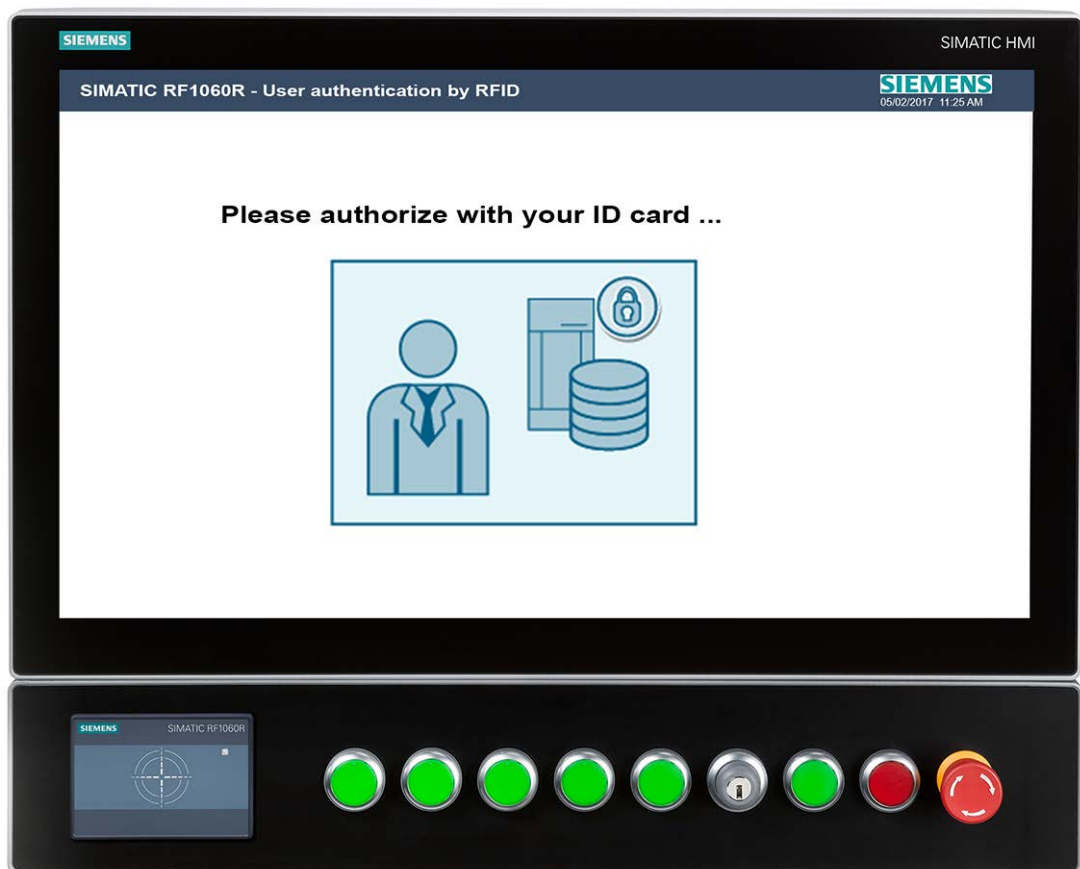


Figure 2-2 Example of an application of a SIMATIC RF1060R in conjunction with a SIMATIC HMI (e.g. 6AV7250-ODC03-0AH0) with extension unit (e.g. 6AV7674-1LA61-0AA0)

2.2 Connection options and supported transponders

Depending on the interface protocol used, the readers can be used for various applications. The following table provides an overview of the possible uses of the readers.

Table 2- 1 Possible uses

	SIMATIC RF1060R	SIMATIC RF1040R/RF1070R		
Interface/Protocol	USB	USB	RS232 / Freeport	
application	PM LOGON, demo application	PM LOGON, demo application	STEP 7 (TIA Portal)	
Programming	DLL for PC	DLL for PC	Ident pro-file/ blocks	P2P blocks
Connector	SIMATIC Panel, PC	SIMATIC Panel, PC	RF170C	e.g. ET 200SP
Cable	Included in the scope of delivery	Included in the scope of delivery	6GT2891-4UH20	6GT2891-2UH30

Supported transponders and protocols

The following table provides an overview of the transponders and protocols supported by the readers.

Table 2- 2 Supported transponders

	SIMATIC RF1040R	SIMATIC RF1060R	SIMATIC RF1070R
MDS D1xx, D3xx, E6xx	✓	✓	✓
MDS D2xx	✓	✓ ¹⁾	✓
MDS D4xx, D5xx	✓	✓	--

✓: Reading the serial number as well as reading and writing the user memory area

¹⁾ Only for read-only access

Table 2- 3 Supported protocols and card types

	SIMATIC RF1040R	SIMATIC RF1060R	SIMATIC RF1070R
ISO 14443 A/B general	Serial number	Serial number	Serial number
ISO 15693 general	✓	✓	✓
LEGIC prime	--	--	✓ ¹⁾
LEGIC advant (ISO 14443 A)	Serial number	Serial number	✓ ¹⁾
LEGIC advant (ISO 15693)	Serial number	Serial number	✓ ¹⁾
MIFARE Classic, EV1 (1k, 4k, Mini)	✓	✓	✓
MIFARE DESFire, EV1/EV2 (2k, 4k, 8k)	✓	✓	✓
MIFARE Plus, EV1 (S, X, L1, L2, L3)	✓	✓	Serial number
MIFARE Ultralight (C)	Serial number	Serial number	Serial number
HID iClass, Inside PicoPass	Serial number	Serial number	Serial number
NXP NTAG21x	Serial number	Serial number	Serial number
FeliCa	Serial number	Serial number	Serial number
EM4100/EM4102	Serial number	--	--
HITAG 1, HITAG S	✓	--	--
HITAG 2	Serial number	--	--

✓: Reading the serial number as well as reading and writing the user memory area

¹⁾ Writing the user memory area is only possible with an identification card (cf. section "Installing and commissioning")

In addition to the specified protocols and card types, a large number of transponder cards (LF, 125 kHz) are generally supported by the readers. If you cannot find the card type that you use in the table, you can ask Siemens Customer Support about the functionality.

Please note that serial numbers (UIDs) of transponders that begin with the byte "0x08" are always newly generated by the transponder. This makes an assignment of serial numbers and transponders impossible. Note that when the serial number is read for transponders with combo chip (e.g. LEGIC CTC4096), only the LEGIC Prime serial number is displayed and not the serial number of the ISO chip 14443/15693.

The reader can be addressed and controlled by functions, for example to change the status of the reader or to communicate with a transponder. With the aid of the functions, you can for example control the three-color reader LED. Which functions exist and how you use them is described in this manual.

Installation

Required tools

You require the following tools to install the readers:

- Torx screwdriver (T10)
- Slotted screwdriver

Mounting the reader

Proceed as follows to install the RF1000 reader:

1. Push the reader through the mounting opening intended for this purpose ($76 [\pm 0.3] \times 48 [\pm 0.3]$ mm) ①.

Make sure that the reader locks in place so that it cannot fall out,

2. Mount the cover plate on the rear of the reader with the 4 Torx screws (max. 1.5 Nm) ②.
3. Tighten the 4 x stud screws (max. 0.5 Nm) ③.
4. If required, mount the optional card holder on the front of the reader.

To do this, place the card holder on the side of the reader housing and press it over the reader front so that the card holder locks in place.

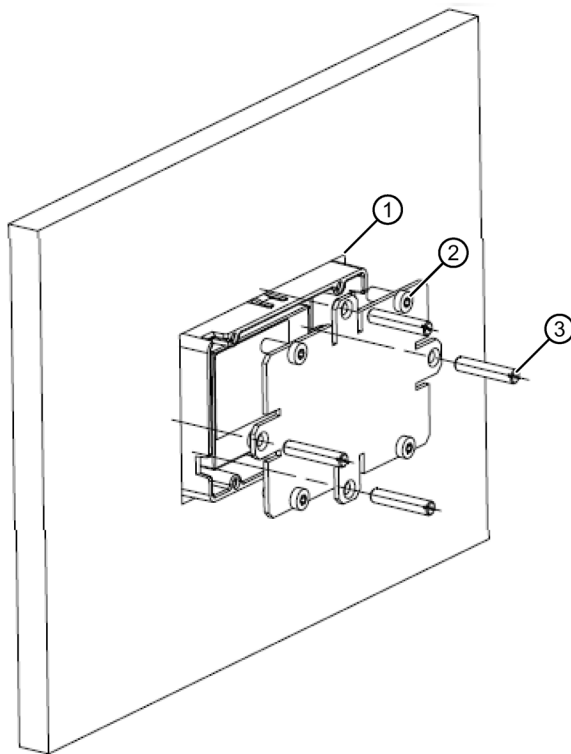


Figure 3-1 Mounting the SIMATIC RF1000 reader

! WARNING

Using the reader in hazardous areas

- When the reader is operated in a hazardous area, the connecting cable (USB or RS232) must be secured with the supplied cable ties and the adhesive socket.
- Secure the cable ties and the adhesive socket about 3 cm behind the reader interface in the installation enclosure.
- Note that installation must not be performed and the connecting cable must not be inserted or removed within the hazardous area.

Observe the "Notes on installation and use" in section "Using the reader in hazardous areas (Page 63)".

! CAUTION

Installation conditions

- The thickness of the wall on which the reader is mounted must be 2-7 mm.
- When the reader is operated in a hazardous area, installation in a control cabinet or closed metal housing is mandatory. The surface of the housing must be smooth and clean.
- The installation opening must have the following dimensions: 76 (± 0.3) × 48 (± 0.3) mm

NOTICE**Repair and maintenance**

Do not try to repair the reader in case of a problem. Repair and maintenance work must only be carried out by qualified personnel. Contact Siemens Support in case of repair or maintenance problems. For more information, refer to the section "Service & Support".

Connecting

! WARNING**Explosion hazard**

Note that installation must not be performed and the connecting cable must not be inserted or removed within the hazardous area.

NOTICE**Permissible power supply**

The device can only be connected to a 5 V DC power supply which satisfies the requirements of safe extra low voltage (SELV).

Required tools

When using the RS232 interface, you need to attach the corresponding cable to the reader first. You require the following tools for this purpose:

- Torx screwdriver (T10)
- Additional tools depending on the connector used

Accessories required

You need the following accessories:

- For communication via the USB interface
the connecting cable included in the scope of delivery
- For communication with the RF170C communications module via the RS232 interface
the connecting cable (6GT2891-4UH20)
- For communication via the RS232 interface
The connecting cable with open ends (6GT2891-2UH30)

Connect the plug

The procedure for connecting the reader depends on the interface over which the reader is being operated.

Connection via USB interface

Proceed as follows to connect the SIMATIC RF1000 reader via the USB interface:

1. Connect the reader to the PC or Panel using the USB cable.

Connection via RS232 interface

Proceed as follows to connect the SIMATIC RF1040R/RF1070R reader via the RS232 interface:

1. When using the cable 6GT2891-2UH30, you may have to install the cable connector at the open cable end.

You can find the connector assignment in the following table.

2. Loosen the cleat on the USB cable and remove the USB cable.
3. Connect the RS232 cable to the RS232 interface (5-pin socket).
4. Fasten the RS232 cable using the cleat.
5. Connect the reader to the communications module or the controller with the RS232 cable.

The table below contains the connector assignment for the connecting cable with open ends (6GT2891-2UH30).

Table 4- 1 Connector assignment of the cable 6GT2891-2UH30

Wire color (open cable end)	PINs (5-pin socket housing; PicoBlade)	Assignment
Red	1	+5 V
Black (x2)	2	GND
Brown	3	Data line, RxD
Orange	4	Data line, TxD

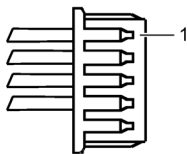


Figure 4-1 PIN assignment of 5-pin socket housing (PicoBlade)

When connecting the SIMATIC RF1000 reader to a serial communications module, ensure that you wire the devices as illustrated below.

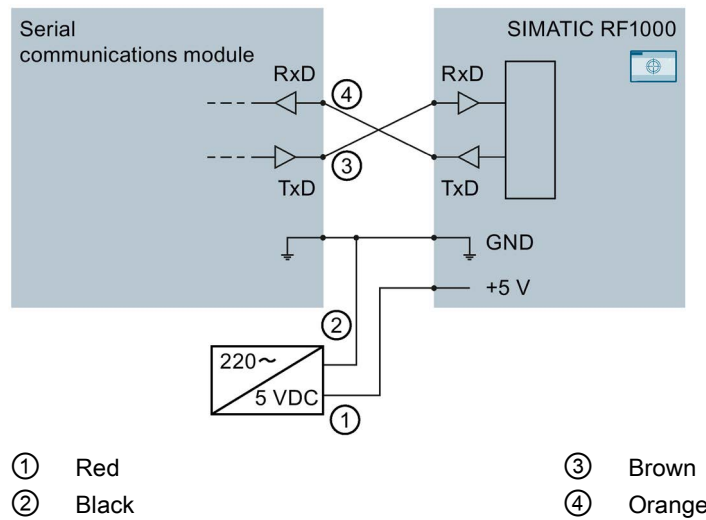


Figure 4-2 Connection diagram: Connecting the reader to a serial communications module

Installing and commissioning

The procedure for installing and commissioning the reader depends on the interface over which the reader is being operated.

Installation and commissioning via the USB interface

Proceed as follows to install and commission the SIMATIC RF1000 reader via the USB interface:

1. Connect the reader to the PC or Panel using the USB cable.

Reaction: The message "A USB device was installed successfully." appears.

2. Copy the DLL drivers and the demo application on your PC using the installation file "RF1000R.exe".

You will find the file on the Internet on the pages of the Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/view/109741590>).

3. Start the demo application by double-clicking on the file "AccessControlDemo.exe".
4. Program the reader using the demo application and the DLL functions.

You will find more information on the demo application in the section "The demo application (Page 51)".

Installation and commissioning via the RS232 interface

Proceed as follows to install and commission the SIMATIC RF1040R/RF1070R reader via the RS232 interface:

1. Connect the reader to the communications module or the controller with the RS232 cable.
2. Configure the freeport protocol (e.g. data bits, parity, stop bits, transmission speed).
3. Program the blocks of the controller.

You will find more information on the freeport protocol in the section "Programming via the RS232 interface (Page 36)".

Configuration card and VHL file

You can transfer reader configurations (e.g. memory areas, addresses, passwords, write permissions, etc.) and autoread configurations to the reader using the configuration card (6GT2300-0CC00-0AX0). These configurations are saved as VHL file in the reader. Multiple configurations (VHL files) of a configuration card can be stored on a reader.

The following options are available to you to change the configuration of a reader with the configuration card:

- Programming using the "vhl_select()" function

When programming in the application, you need to set the "AllowConfig = true" tag when calling the function "vhl_select()" and then hold the configuration card in the antenna field of the reader. After you have changed the configuration, the reader automatically restarts. After the restart, you need to set the "AllowConfig" parameter back to "false".

- Using the demo application ("AccessControlDemo.exe")

To do so, select the "Configcard" option button and click the "Start" button while the configuration card is in the antenna field of the reader.

The configuration card is blank upon delivery. If you prefer to receive the configuration cards with preconfigured, customer-specific configurations, please contact Service & Support (services.ci.industry@siemens.com).

Identification card for LEGIC systems

When using LEGIC systems/cards, you need an identification card to transfer reader configurations to the reader. For this purpose, contact the project owner or the original project supplier.

Programming

Depending on the interface over which the SIMATIC RF1000 readers are being operated, programming must take place either over the USB or the RS232 interface.

6.1 Typical applications

Below you will find typical applications for using the SIMATIC RF1000 readers. The applications are shown as an example using the DLL functions. They can also be implemented with system jobs.

Cyclic reading of serial numbers

A card that is located in the antenna field is selected with the "vhl_select" function. The serial number of the respective card is read with the "vhl_get_snr" function.

Read and write user memory

Prerequisite for reading/writing the memory areas is that the corresponding card type and the application are stored in the reader.

A card that is located in the antenna field is selected with the "vhl_select" function. You can read or write to a required memory area of the respective card with the functions "vhl_read" / "vhl_write". Because there are multiple configurations (VHL files) on the reader, the desired configuration is selected with the "VHLFile" tag.

Autonomous reading ("Autoread")

Prerequisite for autonomous reading of the memory areas is that an "Autoread" configuration is stored in the reader. The "Autoread" configuration can be transferred to the reader using the configuration card.

During autonomous reading you can automatically read a desired memory area of the respective card up to 16 bytes. The "Autoread_SetMode" function switches autonomous reading permanently or one time on or off. During autonomous reading the reader synchronizes the card in the antenna field with the stored configurations. If a match is found, the corresponding memory area is read and output with "Autoread_GetMessage".

6.2 Programming via USB interface

You can program the reader using access functions. You can find the "RF1000R.zip" file on the Siemens support page "Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/view/109741590>)". It includes the DLL files ("BrpDriver_x64" and "BrpDriver_x86"), the DLL functions as well as a demo application which demonstrates the use of the DLL functions.

With the demo application "AccessControlDemo" you can address the reader directly from your application via the USB interface. A precompiled DLL file for Windows systems that provides this function is included in the package.

The DLL files provide various DLL functions for communication with the reader for integration in your application. The reader has return values and status codes to inform you of the reader status and execution of the functions.

You can integrate the DLL files in your application under Microsoft Windows 7/8/10 and use them to call the described functions directly.

6.2.1 Functions of the DLL

6.2.1.1 brp_open_usb_session

The function opens a connection to the reader via the USB interface and returns a session key that is required for all functions and continued communication via this connection. If the connection was successfully established, the value "BRP_OK" is returned.

Note that all the following functions can only be executed after you have established a connection to the reader with the function "brp_open_usb_session". If this is not the case, an error is signaled back.

Note**Parallel operation not possible**

Note that with the application, a connection can only be established to one reader at any one time. For this reason "brp_open_usb_session" may only be called once and before it can be called again must first be closed by the function "brp_close_session".

After a "brp_open_usb_session" the parameter "Handle" must always be = "0". If the parameter ≠ "0", there is either an error or the function "brp_open_usb_session" was called several times in succession.

Function call

```
int  
brp_open_usb_session(  
    int * Handle,  
    DWORD ProductID  
);
```

Table 6- 1 Description of the parameters

Parameter		Description
brp_open_usb_session		The parameter opens a connection to the reader via the USB interface.
	Handle	Session key initialized by this function. The session key is valid as soon as "BRP_OK" is returned.
	ProductID	0x00
Return value		• BRP_OK • BRP_ERR_BUSY • BRP_ERR_GENERAL_IO • BRP_ERR_BUFFER_OVERFLOW • BRP_ERR_NO_MORE_HANDLES • BRP_ERR_INSUFFICIENT_MEM You will find more information on return values in the section "Return values (Page 35)".

6.2.1.2 brp_set_bufsize

This function allows you to define the buffer size for the job and response telegrams. Note that the buffer size is automatically set to the default value of 128 bytes after the restart.

Function call

```
int
brp_set_bufsize(
    int * Handle,
    int TotalBufsize,
    int SendBufsize,
    int RecvBufsize
);
```

Table 6- 2 Description of the parameters

Parameter		Description
brp_open_usb_session		The parameter opens a connection to the reader via the USB interface.
	Handle	The session key returned by the function "brp_open_usb_session".
	TotalBufsize	Specifying the maximum size of the job and response telegram • Default value: 128 bytes (data length 122 bytes) • RF1060R: max. 512 bytes (data length 506 bytes) • RF1040R/RF1070R: max. 1024 bytes (data length 1018 bytes)
	SendBufsize	Specifying the maximum size of the request telegram • Default value: 128 bytes (data length 122 bytes) • RF1060R: max. 512 bytes (data length 506 bytes) • RF1040R/RF1070R: max. 1024 bytes (data length 1018 bytes)

Parameter	Description
RecvBufsize	Specifying the maximum size of the response telegram - Default value: 128 bytes (data length 122 bytes) - RF1060R: max. 512 bytes (data length 506 bytes) - RF1040R/RF1070R: max. 1024 bytes (data length 1018 bytes)
Return value	- BRP_OK - BRP_ERR_BUSY You will find more information on return values in the section "Return values (Page 35)".

6.2.1.3 brp_close_session

This function terminates an existing USB connection that was established earlier.

Function call

```
int
brp_close_session(
    int Handle
);
```

Table 6- 3 Description of the parameters

Parameter	Description
brp_close_session	This parameter terminates a connection.
Handle	The session key returned by the function "brp_open_usb_session".
Return value	- BRP_OK - BRP_ERR_WRONG_HANDLE You will find more information on return values in the section "Return values (Page 35)".

6.2.1.4 syscmd_reset

This function restarts the reader.

Note that you wait for about 3 seconds after the function "syscmd_reset" and then have to execute the functions "brp_close_session" and "brp_open_usb_session" once again.

Function call

```
int
syscmd_reset (
    int Handle,
    int * Status
);
```

Table 6- 4 Description of the parameters

Parameter	Description
syscmd_reset	The parameter restarts the reader.
Handle	The session key returned by the function "brp_open_usb_session".
Status	OK
Return value	BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.5 syscmd_get_info

The function reads out information about the firmware of the reader.

The value read out contains information on the type of firmware, the version and the serial number of the reader.

Function call

```
int
syscmd_get_info(
    int Handle,
    char * fws,
    int * Status
);
```

Table 6- 5 Description of the parameters

Parameter	Description
syscmd_get_info	The parameter reads out information about the firmware of the reader.
Handle	The session key returned by the function "brp_open_usb_session".
fws	This parameter contains information on the type of firmware, the version and the serial number of the reader. Format: xx...xx r.rr.rr dd/dd/dd ssssssss
xx...xx	Firmware type
r.rr.rr	Version (major release, minor release, build ID)
dd/dd/dd	Date of the version
ssssssss	Serial number of the reader
Status	OK
Return value	BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.6 syscmd_get_boot_status

The function returns a boot status.

Each bit of the value returned by the function represents an internal component of the reader. If the component of the reader could not be initialized the corresponding bit is set. Check the value of "boot_status" for the value "0" and output an error or a warning if the values do not match.

Function call

```
int syscmd_get_boot_status(
    int Handle,
    dword * boot_status,
    int * Status
);
```

Table 6- 6 Description of the parameters

Parameter	Description
sys-cmd_get_boot_status	The parameter returns a boot status value.
Handle	The session key returned by the function "brp_open_usb_session".
boot_status	Each bit represents an internal component of the reader.
Status	OK
Return value	You will find more information on return values in the section "Return values (Page 35)".

Note

Value of boot status not equal to "0"

If the function returns a value not equal to "0", please contact "Service & Support".

6.2.1.7 syscmd_set_port

You can use this function to assign parameters to the LEDs and the acoustic signal of the reader. In this way, you can view reader status changes or feedback from the application (e.g. incorrect authentication) via the LED and the acoustic signal.

You can select the desired LED color and/or the acoustic signal using the "port_mask" parameter. You will find a list of possible values in the following table.

Function call

```
int
syscmd_set_port(
    int Handle,
    word port_mask,
    int * Status
);
```

Table 6- 7 Description of the parameters

Parameter		Description
syscmd_set_port		The parameter sets the LED of the reader.
	Handle	The session key returned by the function "brp_open_usb_session".
	port_mask	Each value of the parameter is assigned to a specific LED color or the acoustic signal.
	Status	OK
Return value		BRP_OK You will find more information on return values in the section "Return values (Page 35)".

Table 6- 8 Values of the "port_mask" parameter

Value	LED color / acoustic signal	
0x0000		LED and acoustic signal
0x0001		LED lit green
0x0002		LED lit red
0x0003		LED lit orange
0x0004	--	Acoustic signal (only for RF1040R/RF1070R)
0x0005		Acoustic signal (only for RF1040R/RF1070R) and LED lit green
0x0006		Acoustic signal (only for RF1040R/RF1070R) and LED lit red
0x0007		Acoustic signal (only for RF1040R/RF1070R) and LED lit orange

6.2.1.8 vhl_select

With the help of this function you select a card located in the antenna field. If successful, the status "OK" is returned.

The type of the selected card is returned in the parameter "CardType".

With the "vhl_select" function you can select the card located in the antenna field of the reader. When "VHLSelect" is called again, the currently selected card is changed to the "Hold mode" and "vhl_select" returns the value "NOTAG_ERR". If you want to select a card again without removing it physically from the antenna field, you need to set the "Reselect" parameter to "true".

The "CardTypeMask" parameter allows only specific card families to be selected. If you want to select all cards supported by the hardware of the reader, you need to set the parameter to "0xFFFF". The more significant half byte of the "CardType" parameter specifies the card family (1-6) while the less significant half byte (X) refers to the recognized card type.

Table 6- 9 Assigning the card types

CardTypeMask	CardType	Protocols/card types
0x0001 (bit 1)	0x1X	ISO 14443 A / MIFARE
0x0002 (bit 2)	0x2X	LEGIC Legacy (only for RF1070R)
0x0004 (bit 3)	0x3X	ISO 15693
0x0008 (bit 4)	0x4X	ISO 14443 B
0x0010 (bit 5)	0x5X	Reserved
0x0020 (bit 6)	0x6X	Reserved
0x0080 (Bit 8)	0x8X	(only with RF1040R) EM4100/EM4102, HITAG 1/2/S, HID Prox/ioProx, Keri
0x0200 (Bit 10)	0xAC	(only with RF1040R) SecuraKey
0x0800 (bit 12)	0xCX	LEGIC Prime (only for RF1070R)
0xFFFF	0xFF	All card families

Function call

```
int
vhl_select(
    int Handle,
    word CardTypeMask,
    bool Reselect,
    bool AllowConfig,
    byte * CardType,
    int * Status
);
```

Table 6- 10 Description of the parameters

Parameter	Description
vhl_select	With this parameter you select a card located in the antenna field.
Handle	The session key returned by the function "brp_open_usb_session".
CardTypeMask	With this parameter you specify the card family to be recognized. If you want all card families to be recognized, set the parameter to the value "0xFFFF".
Reselect	The parameter decides whether the card should be reselected.
AllowConfig	This value is "true" when a configuration card is to be read. In normal operation, the value must be set to "false" to prevent an unintentional acceptance of the reader configuration.
CardType	The returned value indicates the card type.

Parameter		Description
	Status	• OK • NOTAG_ERR • HF_ERR • HW_ERR • CONFCARD_READ You will find more information on the reader status in the section "Status codes (Page 48)".
	Return value	• BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.9 vhl_get_snr

The function returns the serial number of the currently selected card. If the function "vhl_select" could not be executed earlier or the card is no longer in the antenna field, the value "CARD_NOT_SELECTED_ERR" (status code "0x0102") is returned. In this case, an undefined serial number is returned. Note that the least significant byte of the serial number is output first. For RF200/RF300 readers, the most significant byte is usually output first.

Function call

```
int
vhl_get_snr(
    int Handle,
    byte * Snr,
    byte * Length,
    int * Status
);
```

Table 6- 11 Description of the parameters

Parameter		Description
vhl_get_snr		The parameter returns the serial number of the currently selected card.
	Handle	The session key returned by the function "brp_open_usb_session".
	Snr	Serial number of the card (LSB first)
	Length	Length of the serial number in bytes
	Status	• OK • CARD_NOT_SELECTED_ERR You will find more information on the reader status in the section "Status codes (Page 48)".
	Return value	• BRP_OK • CARD_NOT_SELECTED_ERR You will find more information on return values in the section "Return values (Page 35)".

6.2.1.10 vhl_is_selected

This function checks whether the card selected the last time the "vhl_select" function was executed is still or once again located in the antenna field. If the card is there, the status "OK" is returned.

Note that this function always returns the return value "CARD_NOT_SELECTED_ERR" when a card is displayed to the reader without the "vhl_select" function being executed first.

Function call

```
int
vhl_is_selected(
    int Handle,
    int * Status
);
```

Table 6- 12 Description of the parameters

Parameter		Description
vhl_is_selected		The parameter checks whether the card selected the last time the "vhl_select" function was executed is still or once again located in the antenna field.
	Handle	The session key returned by the function "brp_open_usb_session".
	Status	- OK - CARD_NOT_SELECTED_ERR You will find more information on the reader status in the section "Status codes (Page 48)".
Return value		BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.11 vhl_read

This function reads the memory area that is stored in a VHL file previously stored in the reader. The VHL configuration stored in the reader is referenced with the "VHLFile ID".

When a card is located in the antenna field and the function was completed, the status "OK" is returned.

Note that this function always returns the return value "CARD_NOT_SELECTED_ERR" when a card is displayed to the reader without the "vhl_select" function being executed first.

Function call

```

int
vhl_read(
    int Handle,
    byte VHLFile,
    word Address,
    word Length,
    byte * Data,
    int * Status
);

```

Table 6- 13 Description of the parameters

Parameter		Description
vhl_read		The parameter reads a previously specified memory area from the card.
	Handle	The session key returned by the function "brp_open_usb_session".
	VHLFile	Number of the VHL file that is to be used.
	Address	Start address of the data that is going to be read.
	Length	Length of the data that is going to be read as of the start address.
	Data	Area in which the received data is stored (max. 65535 bytes).
	Status	• OK • CARD_NOT_SELECTED_ERR • HF_ERR • HW_ERR • CONFIG_ERR • AUTH_ERR • READ_ERR You will find more information on the reader status in the section "Status codes (Page 48)".
Return value		• BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.12 vhl_write

This function writes data to a memory area that is stored in a VHL file previously stored in the reader. The VHL configuration stored in the reader is configured with the "VHLFile ID".

When a card is located in the antenna field and the function was completed, the status "OK" is returned.

Note that this function always returns the return value "CARD_NOT_SELECTED_ERR" when a card is displayed to the reader without the "vhl_select" function being executed first.

Function call

```

int
vhl_write(
    int Handle,
    byte VHLFile,
    word Address,
    word Length,
    byte * Data,
    int * Status
);

```

Table 6- 14 Description of the parameters

Parameter		Description
vhl_write		The parameter writes data to a previously specified memory area of the card.
	Handle	The session key returned by the function "brp_open_usb_session".
	VHLFile	Number of the VHL file that is to be used.
	Address	Start address of the data that is going to be written.
	Length	Length of the data that is going to be written as of the start address.
	Data	Area in which the written data is stored (max. 65535 bytes).
	Status	• OK • CARD_NOT_SELECTED_ERR • HF_ERR • HW_ERR • CONFIG_ERR • AUTH_ERR • READ_ERR You will find more information on the reader status in the section "Status codes (Page 48)".
Return value		• BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.13 Autoread_SetMode

This function controls the "Autoread" functionality during runtime. The memory content of the cards that enter the antenna field of the reader is automatically read in "Autoread" mode without an explicit read job. The read data is output with the "Autoread_GetMessage" function.

Note that the "vhl_select" function is executed cyclically in "Autoread" mode. If the "vhl_select" function is executed as well, this can result in the card not being recognized when it enters the antenna field of the reader because it was already read in "Autoread" mode. In addition, the mode is ended with the function call "vhl_select" in "Autoread" mode. Make sure that the "vhl_select" function is not executed in addition in "Autoread" mode.

By activating/deactivating the "Autoread" function, the "MessageBuffer" is deleted. This ensures that no incorrect results are supplied by a subsequent call of the "Autoread_GetMessage" function when no card is located in the antenna field.

Function call

```
int
brp_exec_comand(
    int Handle,
    byte devcode,
    byte cmdcode,
    byte * param,
    byte param_len,
    init timeout,
    init * Status,
    byte * resp,
    int * resp_len,
    init max_resp_len
);
```

Table 6- 15 Description of the parameters

Parameter		Description
brp_exec_comand		The parameter activates/deactivates the "Autoread" functionality.
	Handle	The session key returned by the function "brp_open_usb_session".
	devcode	0x05
	cmdcode	0x00
	param	Buffer for the function parameters: 0x00: The "Autoread" functionality is deactivated and VHL functions can be used. 0x01: The "Autoread" functionality is permanently switched on. There is a permanent check as to whether a card is located in the antenna field. 0x02: The "Autoread" functionality is executed once as soon as a card enters the antenna field. This is followed by a switch to VHL mode. The card identification is executed one more time with another call using the parameter value 0x02.
	param_len	0x01
	timeout	Time in [ms] until the action is aborted (500 is the recommended value).
	Status	OK You will find more information on the reader status in the section "Status codes (Page 48)".
	resp	Buffer for the received data
	resp_len	Current length of the response data in bytes
	max_resp_len	Maximum length of the response data
Return value		BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.14 Autoread_GetMessage

This function reads data from a transponder located in the antenna field. Up to 16 bytes of data can be read autonomously with this function.

Function call

```
int
brp_exec_comand(
    int Handle,
    byte devcode,
    byte cmdcode,
    byte * param,
    byte param_len,
    init timeout,
    init * Status,
    byte * resp,
    int * resp_len,
    init max_resp_len
);
```

Table 6- 16 Description of the parameters

Parameter	Description
brp_exec_comand	The parameter reads data from a transponder located in the antenna field.
Handle	The session key returned by the function "brp_open_usb_session".
devcode	0x05
cmdcode	0x01
param	--
param_len	0x00
timeout	Time in [ms] until the action is aborted (100 is the recommended value).
Status	- OK - ERR_NOMESSAGE - ERR_AR_DISABLED You will find more information on the reader status in the section "Status codes (Page 48)".
resp	Buffer for the received data - Byte 0: Message type (0x00 for card identification) - Byte 1: Message length in bytes - Byte 2: ... message length +1: Message data
resp_len	Current length of the response data in bytes
max_resp_len	Maximum length of the response data
Return value	BRP_OK You will find more information on return values in the section "Return values (Page 35)".

6.2.1.15 Return values

The following table contains a list of the possible values that the reader can return for the various functions.

Table 6- 17 Return values

Value	Variable	Description
0x00	BRP_OK	No error has occurred
0x01	BRP_ERR_STATUS	The reader has returned a status code that is ≠ "0".
0x02	BRP_ERR_BUSY	The reader is currently processing a function.
0x03	BRP_ERR_IDLE	The reader is waiting for a function.
0x04	BRP_ERR_TIMEOUT	The response time has been exceeded.
0x05	BRP_ERR_CORRUPTED_FRAME	A bad frame was detected.
0x06	BRP_ERR_UNEXPECTED_FRAME	An unexpected frame was detected.
0x07	BRP_ERR_GENERAL_IO	The underlying serial port has caused an error.
0x08	BRP_ERR_BUFFER_OVERFLOW	The reader sent more data than expected.
0x09	BRP_ERR_NO_MORE_HANDLES	There is no free session key.
0x0A	BRP_ERR_INSUFFICIENT_MEM	There is not enough memory to generate a new session key.
0x0B	BRP_ERR_WRONG_HANDLE	The specified session key does not exist.
0x0C	BRP_ERR_WRONG_PARAMETERS	The parameters of a function are incorrect.

6.3 Programming via the RS232 interface

When the RF1040R/RF1070R readers are connected to a SIMATIC controller, communication takes place via the freeport protocol. The freeport protocol allows you to communicate with the reader directly on the lowest level. A USB connection is not required for this.

The telegrams are listed in a byte coding in the following sections; you can apply the byte coding directly to the user program of the controller.

The communication parameters of the RS232 interface of the reader are set as follows in the factory:

- Data bits: 8
- Parity: None
- Stop bits: 1
- Transmission speed: 115.2 kBd

Connection via a communications module or serial module

The reader can be connected to a SIMATIC controller using a communications module with RS232 interface (e.g. RF170C). With a connection via the CM, you need to set the communication parameters of the CM as follows:

Table 6- 18 Setting options in the "Module parameters" parameter group of the CM when using the freeport protocol

Parameter	Parameter value	Description
User mode	Ident profile/RFID standard profile FB 45 / FC 45	Selection of the block with which you want to assign parameters to the reader.
MOBY mode	Freeport protocol	The parameter value "Freeport protocol" must be selected in this parameter.
Transmission speed	115.2 kBd	The parameter value "115.2 kBd" must be selected in this parameter.
Diagnostic messages	None Hard errors	Selection of whether hardware diagnostics messages are reported.
Suppression of error LED	None Channel 1 Channel 2	Selection of whether the error LED (ERR) of a channel is suppressed.
Interface	RS232	The parameter value "RS232" must be selected in this parameter.

Alternatively, the connection can be made using a serial module with RS232 interface and P2P communication (e.g. ET 200SP CM PTP).

6.3.1 Implementation of the system jobs

The different jobs are described in more detail below. Note that you must wait for the respective response telegram (reader response time) before you can send new request telegrams.

The parameter length is entered in "Big Endian" format and always refers to the user data as of byte 5 excluding the optional checksum. All other data is output in "Little Endian" format.

Implementation with connection via a communications module

Communication takes place using the ident blocks / the ident profile or the function block FB 45. The "Write" command handles the sending of data and the "Read" command the receipt of data. The maximum length of the telegrams (header and data) is 233 bytes or 229 bytes with the Ident profile.

Before you execute a "Read" or "Write" command for the first time, you need to execute a "Reset" command once. With the "Reset" command, communication between the CM (e.g. RF170C) and reader is reset and the buffer is emptied. The 11th byte ("option_1") of parameter "PARAM" can be occupied by "0" or "2". The value "0x04" must be entered in the 1st byte, and "0x0A" in the 6th byte.

Checksum calculation ("BCC8")

Note that all bytes of the telegram must be linked with an "XOR" logical operator to calculate the checksum. The result is shown in the "Optional checksum" field.

6.3.2 System jobs

6.3.2.1 syscmd_reset

Max. reader response time: 100 ms

Table 6- 19 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x03	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0xC2	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 20 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x03	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0xC2	Optional checksum (when the value "0x1C" is set in byte 0)

6.3.2.2 syscmd_get_info

Max. reader response time: 50 ms

Table 6- 21 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x04	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0xC5	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 22 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x04	CmdCode
3	0x29	Parameter length (e.g. 41 bytes)
4	0x00	
5 ... 45	0x01 ...	Firmware version of the reader, date of manufacture as ASCII value Example: 1100 IDE Z 1.02.00 09/18/18 43025112
46	0xFF	Optional checksum (when the value "0x1C" is set in byte 0)

6.3.2.3 syscmd_get_boot_status

Max. reader response time: 50 ms

Table 6- 23 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x05	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0xC4	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 24 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x05	CmdCode
3	0x04	Parameter length (4 bytes)
4	0x00	
5 ... 8	0x00	Boot status = 0x00 (OK)
9	0x48	Optional checksum (when the value "0x1C" is set in byte 0)

6.3.2.4 syscmd_set_port

Max. reader response time: 100 ms

Table 6- 25 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x07	CmdCode
3	0x02	Parameter length (2 bytes)
4	0x00	

Byte	Value	Description
5	0x00	port_msk:
6	0xXX	0x00: LED and acoustic signal 0x01: LED lit green 0x02: LED lit red 0x03: LED lit orange 0x04: Acoustic signal (only for RF1040R/RF1070R) 0x05: Acoustic signal (only for RF1040R/RF1070R) and LED lit green 0x06: Acoustic signal (only for RF1040R/RF1070R) and LED lit red 0x07: Acoustic signal (only for RF1040R/RF1070R) and LED lit orange
7	0xXX	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 26 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x00	DevCode
2	0x07	CmdCode
3	0x00	Parameter length (0 bytes)
4	0x00	
5	0xC6	Optional checksum (when the value "0x1C" is set in byte 0)

6.3.2.5 vhl_select

Max. reader response time: 3 s

Table 6- 27 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x00	CmdCode
3	0x04	Parameter length (4 bytes)
4	0x00	
5	0xFF	Mask for the card type (e.g. 0xFFFF)
6	0xFF	You can find detailed information on the card types in the section "vhl_select (Page 27)".
7	0x01	Reselect = 0x01
8	0x00	AllowConfig = 0x00
9	0xXX	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 28 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x00	CmdCode
3	0x01	Parameter length (1 byte)
4	0x00	
5	0x30	Card type (e.g. 0x30) You can find detailed information on the card types in the section "vhl_select (Page 27)".
6	0x0D	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 29 Response telegram with errors

Byte	Value	Description
0	0x8C	Without checksum
	0x9C	With checksum
1	0x01	DevCode
2	0x00	CmdCode
3	0x01	Parameter length (1 byte)
4	0x00	
5	0x01	Status e.g. 0x01 ("NOTAG_ERR") Possible status codes: • NOTAG_ERR • HF_ERR • HW_ERR • CONFCARD_READ
6	0xD9	Optional checksum (when the value "0x9C" is set in byte 0)

6.3.2.6 vhl_get_snr

Max. reader response time: 100 ms

Table 6- 30 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x01	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0x0D	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 31 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x01	CmdCode
3	0x04	Parameter length, depending on card type (e.g. 4 bytes)
4	0x00	
5	0x11	Serial number of the card, depending on card type
6	0x22	
7	0x33	
8	0x44	
9	0xXX	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 32 Response telegram with errors

Byte	Value	Description
0	0x8C	Without checksum
	0x9C	With checksum
1	0x01	DevCode
2	0x01	CmdCode
3	0x01	Parameter length (1 byte)
4	0x00	
5	0x02	CARD_NOT_SELECTED_ERR
6	0x9F	Optional checksum (when the value "0x9C" is set in byte 0)

6.3.2.7 vhl_is_selected

Max. reader response time: 3 s

Table 6- 33 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x04	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0x08	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 34 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x04	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0x08	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 35 Response telegram with errors

Byte	Value	Description
0	0x8C	Without checksum
	0x9C	With checksum
1	0x01	DevCode
2	0x04	CmdCode
3	0x01	Parameter length (e.g. 1 byte)
4	0x00	
5	0x02	CARD_NOT_SELECTED_ERR
6	0x9A	Optional checksum (when the value "0x9C" is set in byte 0)

6.3.2.8

vhl_read

Max. reader response time: 3 s

Table 6- 36 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x02	CmdCode
3	0x05	Parameter length (e.g. 5 bytes)
4	0x00	
5	0x01	VHL file (e.g. 0x01)
6	0x00	Address (e.g. 0x37)
7	0x37	
8	0x00	Length (e.g. 0x08)
9	0x08	
10	0xFF	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 37 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x02	CmdCode
3	0x08	Parameter length (e.g. 8 bytes)
4	0x00	
5 ... 12	0xCC	Read data (e.g. 0xCC)
13	0XX	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 38 Response telegram with errors

Byte	Value	Description
0	0x8C	Without checksum
	0x9C	With checksum
1	0x01	DevCode
2	0x02	CmdCode
3	0x01	Parameter length (e.g. 1 byte)
4	0x00	
5	0x06	Status e.g. 0x06 ("READ_ERR") Possible status codes: • CARD_NOT_SELECTED_ERR • HF_ERR • HW_ERR • CONFCARD_READ • AUTH_ERR • READ_ERR
6	0XX	Optional checksum (when the value "0x9C" is set in byte 0)

6.3.2.9 vhl_write

Max. reader response time: 3 s

Table 6- 39 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x03	CmdCode
3	0x0D	Parameter length (e.g. 13 bytes)

Byte	Value	Description
4	0x00	
5	0x01	VHL file (e.g. 0x01)
6	0x00	Address (e.g. 0x42)
7	0x42	
8	0x00	Length (e.g. 0x08)
9	0x08	
10 ... 17	0x33	Data to be written (e.g. 0x33)
18	0xFF	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 40 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x01	DevCode
2	0x03	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0x0F	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 41 Response telegram with errors

Byte	Value	Description
0	0x8C	Without checksum
	0x9C	With checksum
1	0x01	DevCode
2	0x03	CmdCode
3	0x01	Parameter length (e.g. 1 byte)
4	0x00	
5	0x03	Status e.g. 0x03 ("HF_ERR") Possible status codes: • CARD_NOT_SELECTED_ERR • HF_ERR • HW_ERR • CONFCARD_READ • AUTH_ERR • WRITE_ERR
6	0x9C	Optional checksum (when the value "0x9C" is set in byte 0)

6.3.2.10 Autoread_SetMode

Max. reader response time: 100 ms

Table 6- 42 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x05	DevCode
2	0x00	CmdCode
3	0x01	Parameter length (1 byte)
4	0x00	
5	0xXX	Autoread: - Off (0x00) - On, permanently (0x01) - On, once (0x02)
6	0xXX	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 43 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x05	DevCode
2	0x00	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0xC4	Optional checksum (when the value "0x1C" is set in byte 0)

6.3.2.11 Autoread_GetMessage

Max. reader response time: 100 ms

Table 6- 44 Request telegram

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x05	DevCode
2	0x01	CmdCode
3 ... 4	0x00	Parameter length (0 bytes)
5	0x4D	Optional checksum "BCC8" (when the value "0x1C" is set in byte 0)

Table 6- 45 Response telegram without errors

Byte	Value	Description
0	0x0C	Without checksum
	0x1C	With checksum
1	0x05	DevCode
2	0x01	CmdCode
3	0x07	Parameter length (7 bytes)
4	0x00	
5	0x00	Message type
6	0x05	Message length (e.g. 0x05)
7 ... 11	0x11	Data from the user memory (e.g. 0x11)
12	0xFF	Optional checksum (when the value "0x1C" is set in byte 0)

Table 6- 46 Response telegram with errors

Byte	Value	Description
0	0x8C	Without checksum
	0x9C	With checksum
1	0x05	DevCode
2	0x01	CmdCode
3	0x01	Parameter length (1 byte)
4	0x00	
5	0x01	Status e.g. 0x01 ("BRP_ERR_STATUS") Possible status codes: • ERR_NOMESSAGE • ERR_AR_DISABLED • BRP_ERR_STATUS
6	0xDC	Optional checksum (when the value "0x9C" is set in byte 0)

6.4 Status codes

The following table contains a list of the status codes of the VHL command set divided up into command groups.

Table 6- 47 General status codes

Value		Variable	Description
USB	RS232		
syscmd			
0x0000	0x00	STATUS_OK	No error
vhl			
0x0101	0x01	NOTAG_ERR	Transponder does not exist or no response. This status code requires reselection of the card with the function "vhl_select".
0x0102	0x02	CARD_NOT_SELECTED_ERR	The function cannot be executed because no transponder is selected.
0x0103	0x03	HF_ERR	Communications problems with the transponder.
0x0104	0x04	CONFIG_ERR	The structure of the VHL file is invalid or the VHL file was not found.
0x0105	0x05	AUTH_ERR	Authentication error. The keys in the VHL file are invalid (MIFARE) or the stamp in the reader is invalid (LEGIC cards).
0x0106	0x06	READ_ERR	The communications sequence is successful, but reading failed.
0x0107	0x07	WRITE_ERR	This value is currently not supported.
0x0108	0x08	CONFCARD_READ	A transponder was recognized.
0x0109	0x09	INVALID_CARD_FAMILY_ERR	The required transponder type does not match the transponder family of the currently selected transponder.
0x010A	0x0A	NOT_SUPPORTED_ERR	The function is not supported.
0x010B	0x0B	VHL_FORMAT_ERR	Format error
0x010C	0x0C	VHL_HW_ERR	Hardware problems during access (e.g. on the reader chip)
Autoread			
0x0501	0x01	NO_MESSAGE_ERR	No valid card / no valid transponder recognized.
0x0502	0x02	SCRIPT_RUNTIME_ERR	Runtime error detected during script execution.
0x0503	0x03	SCRIPT_SYNTAX_ERR	Syntax error in the script
0x0504	0x04	SCRIPT_NOT_IMPL_ERR	Scripts does not exist.
0x0510	0x10	AR_DISABLED_ERR	"Autoread" function is switched off.

The functions are constructed so that if execution fails, they are automatically repeated. This compensates any communications problems that may occur, e.g. due to bad RF signal quality as a result of external influences.

Table 6- 48 RS232-specific status codes

Value	Variable	Description
0x00	OK	No error
0x40	CMD_WORK	The job is currently being processed.
0x41	INVAILD_CMD_ERR	Invalid function Causes: • The function is not valid. • The parameters are invalid. • The response exceeds 255 bytes. • Missing configuration
0x42	ACCESS_DENIED_ERR	Missing authentication
0x81	TIMEOUT_ERR	The reader is currently in timeout.
0x82	FRAME_ERR	Invalid command from host.
0x83	AME_OVERFLOW_ERR	The length of the response exceeds the maximum permissible length.
0x84	CHK_ERR	Invalid checksum in the host command.

The demo application

The demo application contained in the file "RF1000R.exe" helps you to understand the available functions. You will find the file on the Siemens "Industry Online Support (<https://support.industry.siemens.com/cs/ww/en/view/109741590>)" page.

The available software package contains a demo application based on "Windows .NET 3.5" including source code files. This demo application serves as a model on the basis of which you can program your own user application. The demo application includes all the functions described in the following sections and is fully functional. This gives you the opportunity of testing your readers directly using the demo application.

Note**Disclaimer of liability**

Note that Siemens AG accepts no liability for the demo application.

7.1 User interface of the demo application

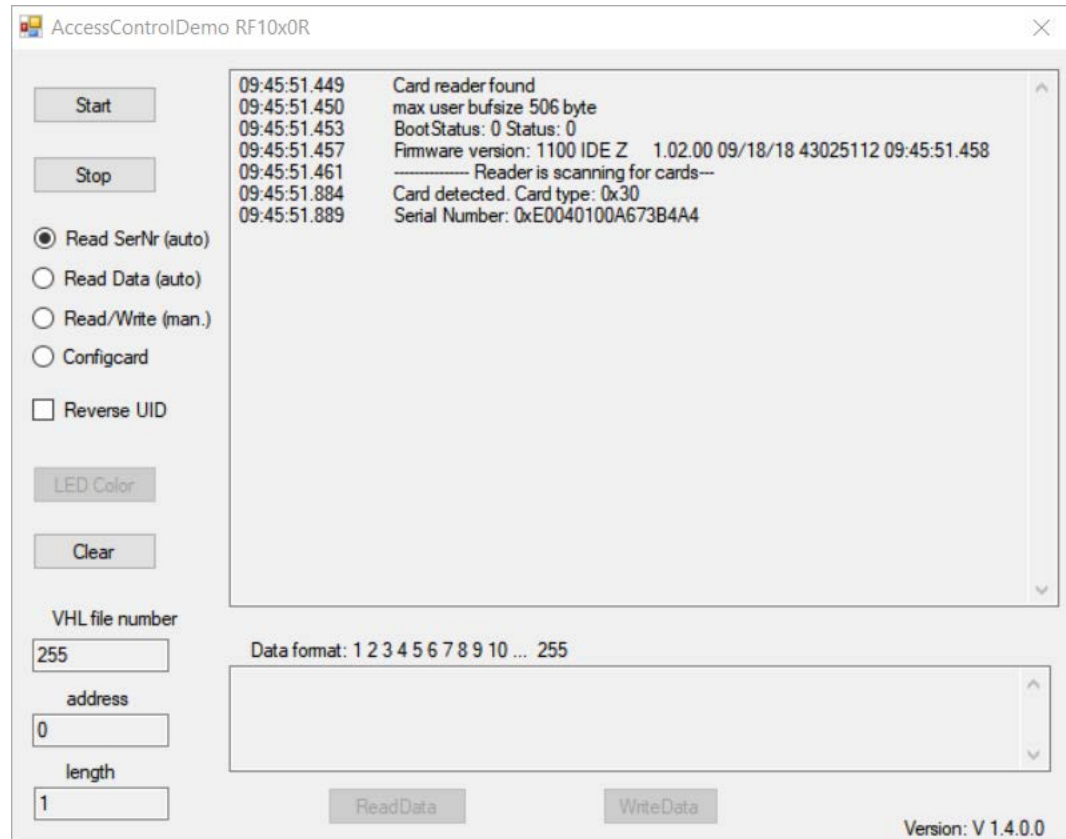
Requirement

To be able to work with the demo application, .NET 3.5 must be installed on your PC (Windows) and the "RF1000R.exe" file must be unpacked.

Working with the demo application

Follow the steps below to work with the demo application:

1. Start the demo application by double-clicking on the file "AccessControlDemo.exe".



Buttons

Start	Establishes the USB connection to the reader.
Stopp	Terminates the USB connection to the reader.
LED Color	Switches the LED color and activates the acoustic signal.
Clear	Emptying the top display area.
Read Data	Manual reading of the transponder data.
Write Data	Manual writing of the transponder data.

Option buttons/Check boxes

Read SerNr (auto)	Automatic reading of the serial number and the card type.
Read Data (auto)	Automatic reading of the transponder data depending on the specific card type configuration.
Read/Write (man.)	Manual reading/writing of the transponder data depending on the selected parameters.
Configcard	Transferring the configuration from the configuration card in the antenna field to the reader.
Reverse UID	Reversing the byte sequence when the serial number is output.

Input boxes

- VHL file number Input box for the number of the VHL file.
- address Input box for the start address as of which the transponder data is to be read or written.
- length Input box for the data length of the transponder data to be read/written.

Figure 7-1 Example view of reading a serial number

The version number of the demo application is shown at the bottom right in the application.

- Click the "Start" button to set up the connection to the reader and start the selected action.

Option button	Description
Read SerNr (auto)	Automatic reading of the serial number and the card type. The data is output in the top display area.
Read Data (auto)	Automatic reading of the transponder data depending on the specific card type configuration. The data is output in the bottom display area. If no matching specific card type configuration is stored in the reader, the error message "0x501" is output.
Read/Write (man.)	Manual reading/writing of the transponder data depending on the selected configuration file ("VHL file number") as well as the start address and the data length ("address" and "length"). The read or write operation is initiated with the "Read Data" or "Write Data" buttons. The transponder data to be written or read are edited or output in the bottom input/display area.
Configcard	Transferring the configuration from the configuration card in the antenna field to the reader. Note the the connection is terminated after the transfer ("Stop") and must be reestablished ("Start").

- To clear the display area, click on the "Clear" button.
- Click on the "Stop" button to disconnect the connection to the reader.

7.2 Create your own PC application via the USB interface

Requirement

- You have extracted the "RF1000R.exe" file onto your PC (Windows).
- The reader is connected.

Note that the demo application is capable of running without Microsoft Visual Studio (Express) being installed. You can view the source code with a text editor. To edit the source code you require Microsoft Visual Studio (Express) on your PC.

Create your own "Read serial number" application

Follow the steps below to create your own application for reading the serial number:

1. Establish the connection to the reader ("brp_open_usb_session").
2. Check cyclically whether a transponder is located in the read range of the reader ("vhl_select").

There is transponder in the read range:

- The transponder is recognized.
- Read out the serial number ("vhl_get_snr").
- Signal the application that the transponder with the serial number "x" was recognized.
- Check cyclically whether the transponder is still in the read range.

The transponder is no longer within the read range:

- Signal the application that the transponder with the serial number "x" is no longer recognized.

3. Terminate the connection to the reader ("brp_close_session").

The source code of the demo application can serve as an example for your own application.

Create your own "Autonomous reading" application

Requirements: A corresponding configuration is stored in the reader.

Follow the steps below to create your own application for autonomous reading of the transponder data:

1. Establish the connection to the reader ("brp_open_usb_session").
2. Activate Autoread mode ("Autoread_SetMode"; "param" = 0x01 or 0x02).
 - The transponder is recognized automatically.
 - Read the transponder data ("Autoread_GetMessage").
3. Terminate the connection to the reader ("brp_close_session").

The source code of the demo application can serve as an example for your own application.

Create your own "Read/write memory area" application

Requirements: A corresponding configuration is stored in the reader.

Follow the steps below to create your own application for reading or writing user data:

1. Establish the connection to the reader ("brp_open_usb_session").
2. Check cyclically whether a transponder is located in the read range of the reader ("vhl_select").

When a transponder is located in the read range:

- The transponder is recognized.
- You can read data from the memory area with the "vhl_read" function.
- You can write data to the memory area with the "vhl_write" function.

3. Terminate the connection to the reader ("brp_close_session").

The source code of the demo application can serve as an example for your own application.

Own application "Transfer reader configuration"

Follow the steps below to transfer a reader configuration using a configuration card:

1. Establish the connection to the reader ("brp_open_usb_session").
2. Check whether a configuration card is located in the read range of the reader ("vhl_select"; "AllowConfig = true").

If a configuration card is located in the read range, the status code "CONFIG_READ" or "HF_ERR" is returned and the configuration is transferred to the reader. Parameterization is complete as soon as "vhl_select = STATUS_OK" is returned.

3. Terminate the connection to the reader ("brp_close_session").
4. Establish the connection to the reader again ("brp_open_usb_session").

The source code of the demo application can serve as an example for your own application.

Technical specifications

Table 8- 1 Technical specifications

6GT2831-6xA50	
Product type designation	SIMATIC RF1040R SIMATIC RF1060R SIMATIC RF1070R
Radio frequency	
Operating frequency	- RF1040R: 125 kHz; 13.56 MHz - RF1060R: 13.56 MHz - RF1070R: 13.56 MHz
Protocol for wireless transmission	RF1040R, RF1060R, RF1070R: ISO 14443 A/B, ISO 15693, LEGIC advant, MIFARE Classic, MIFARE DESFire, MIFARE Plus, MIFARE Ultralight, HID iClass, NXP NTAG21x, FeliCa RF1040R (in addition): EM4100/EM4102, HITAG 1, HITAG S, HITAG 2 RF1070R (in addition): LEGIC prime
Electrical data	
Maximum range	30 mm
Mechanical specifications	
Housing	
Material	PC-GF
Color	TI-Gray
Interfaces	
Interface to the communications module	- USB 2.0 - RS232 (115.2 kBd; no parity) ¹⁾
Antenna	integrated
Supply voltage, current consumption, power loss	
Power supply	4.6 to 5.25 V DC
Current consumption	typically 150 mA; max. 300 mA

6GT2831-6xA50	
Permitted ambient conditions	
Ambient temperature	
• During operation	• -25 ... +55 °C
• During transportation and storage	• -25 ... +55 °C
Minimum distance between two readers	15 cm
Degree of protection to EN 60529	In installed state: front IP65; rear IP20
Shock-resistant to EN 60721-3-7, Class 7 M2	300 m/s ²
Vibration-resistant to EN 60721-3-7, Class 7 M2	50 m/s ²
Design, dimensions and weights	
Dimensions (W × H × D)	
• excl. card holder	• 90 × 62 × 23.5 mm
• Incl. card holder	• 99 × 62 × 34.6 mm
• Mounting opening	• 76 (± 0.3) × 48 (± 0.3) mm
Weight	approx. 120 g
Type of mounting	Door installation • 4 x stud screws (slotted screws) M4 x 20; Tightening torque ≤ 0.5 Nm • 4 x Torx screws (EJOT) T10 x 10; Tightening torque ≤ 1.5 Nm • Installation wall thickness 2-7 mm
Cable length reader ↔ communications module	1.8 m USB connecting cable
Display elements	• LED, 3 colors • Acoustic signal ¹⁾
Approvals	CE, FCC, IC ATEX ²⁾
MTBF	28 years

¹⁾ Only in conjunction with the SIMATIC RF1040R reader as of product version "AS: A" and SIMATIC RF1070R as of product version "AS: B".

²⁾ Only in conjunction with the SIMATIC RF1060R readers as of product version "AS: B" and SIMATIC RF1070R as of product version "AS: C".

Dimension drawing

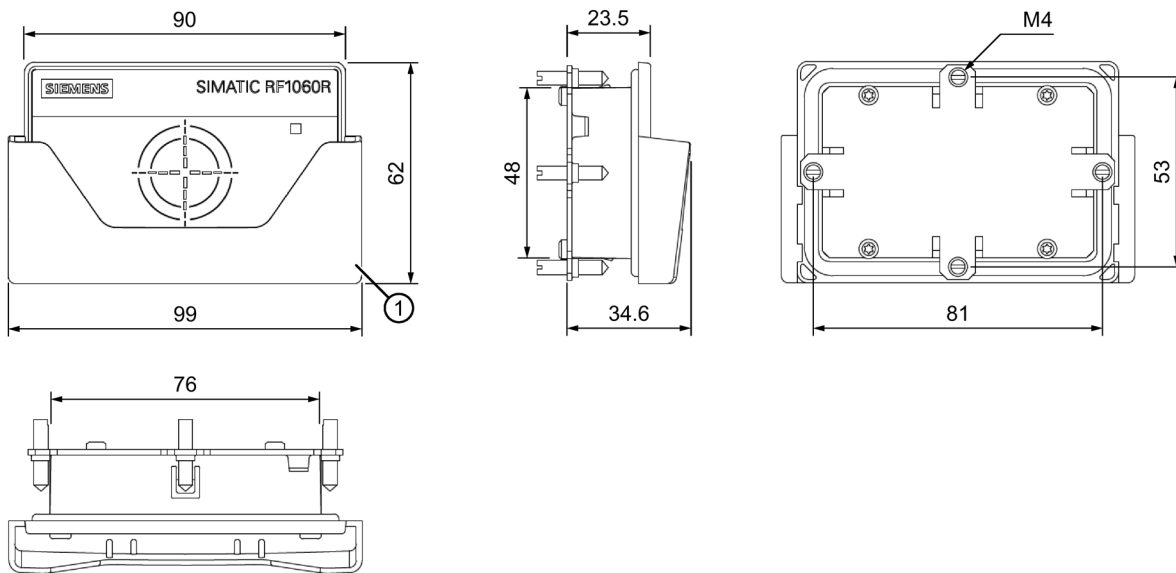


Figure 9-1 Dimension drawing SIMATIC RF1040R/RF1060R/RF1070R with optional card holder ①

All dimensions in mm

Appendix

A.1 Certificates & approvals

A.1.1 Country-specific approvals

Table A- 1 Country-specific approvals

Marking	Description
	CE according to RED directive 2014/53/EU CE according to RoHS directive 2011/65/EU
 Federal Communications Commission	1) Part 15 Clause 15.105: "Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: • Reorient or relocate the receiving antenna. • Increase the separation between the equipment and receiver. • Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. • Consult the dealer or an experienced radio/TV technician for help." 2) Statement for Part 15 Clause 15.21: "Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment." 3) Statement for FCC Part 15.19: "This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: • (1) This device may not cause harmful interference, and • (2) this device must accept any interference received, including interference that may cause undesired operation."

Marking	Description
Industry Canada Radio Standards Specifications	CAN ICES-3 (B)/NMB-3(B) This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: 1) This device may not cause interference; and 2) This device must accept any interference, including interference that may cause undesired operation of the device. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : 1) l'appareil ne doit pas produire de brouillage; 2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
 00860-17-04794	Brazil (ANATEL) (only SIMATIC RF1060R/RF1070R) Certificado de Homologação
 07881-18-04794	REPÚBLICA FEDERATIVA DO BRASIL AGÊNCIA NACIONAL DE TELECOMUNICAÇÕES Este produto está homologado pela ANATEL, de acordo com os procedimentos regulamentados pela Resolução 242/2000, e atende aos requisitos técnicos aplicados. Para maiores informações, consulte o site da ANATEL: www.anatel.gov.br ANATEL IDs: - SIMATIC RF1060R: 00860-17-04794 - SIMATIC RF1070R: 07881-18-04794 Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.
	EAC (Eurasian Conformity) Eurasian Economic Union of Russia, Belarus, Armenia, Kazakhstan and Kyrgyzstan Declaration of conformity according to the technical regulations of the customs union (TR ZU)
Mexico (IFETEL)	Mexico (IFETEL) (only SIMATIC RF1060R/RF1070R) Instituto Federal de Telecomunicaciones - SIMATIC RF1060R: RCPSIRF16-2053 - SIMATIC RF1070R: RCPSIRF18-2240
	South Korea (KCC) (only SIMATIC RF1060R/RF1070R) Korea Communications Commission Certificate of Broadcasting and Communication Equipments Republic of Korea - SIMATIC RF1060R: MSP-CRM-RF5-RF1060R - SIMATIC RF1070R: R-C-RF5-RF1070R

Marking	Description
Thailand	Marking requirements (only SIMATIC RF1060R/RF1070R): Following statement may be displayed on packaging or additional page or on user's manual. For Sdoc, it is optional to display this wording. “เครื่องโทรคมนาคมและอุปกรณ์นี้มีความสอดคล้องตามมาตรฐานหรือข้อกำหนดทางเทคนิคของ กสทช.” This telecommunication equipment conforms to the technical standards or requirements of NBTC.

A.1.2 Using the reader in hazardous areas

NOTICE
Device-specific validity of the directive Please note that the directive and marking described in this section are valid only for the SIMATIC RF1000 readers with the following product versions: • SIMATIC RF1060R as of product version "AS: B" • SIMATIC RF1070R as of product version "AS: C" The directive/marking is not valid for other device variants or older product versions.

NOTICE
Validity only when the devices are marked The corresponding approval only exists for devices to which the Ex mark is applied.

TÜV NORD CERT GmbH, appointed center no. 0044 as per Article 18 of the directive of the European Council of 26 February 2014 (2014/34/EU), has confirmed compliance with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in hazardous areas as per Annex II of the directive.

The essential health and safety requirements are satisfied in accordance with the standards:

- EN IEC 60079-0: Equipment - General requirements
- EN 60079-7: Equipment protection by increased safety "e"
- EN 60079-31: Equipment dust ignition protection by enclosure "t"

This allows the reader to be used in hazardous areas for gases, for the device category 3 G and gas group IIC, or alternatively in hazardous areas for dusts, for the device category 3 D and group IIIC.

Marking

The EU conformity marking of the electrical equipment according to the ATEX, EMC, RoHS directive is:



II 3 G Ex ec IIC T₄ Gc
 II 3 D Ex tc IIIC T80 °C Dc
 TÜV 19 ATEX 225698

Ta.: -25 °C ... +55 °C

4.75 ... 5.25 V DC, < 300 mA

Installation and operating conditions for hazardous areas**NOTICE****Notes on installation and use**

Note the following conditions when installing, maintaining and operating the device in a hazardous area:

- The permissible ambient temperature range is $-25\text{ °C} \leq T_a \leq 55\text{ °C}$.
- The RFID readers/writers must be protected against UV light.
- EPL Gc: The RFID readers/writers can only be used in areas with degree of pollution 2 or better, as defined in IEC 60991-1.
- The RFID readers/writers can only be commissioned in either II 3G or II 3D hazardous areas. Hazardous areas with mixed atmospheres are not permitted.
- During installation, the surface of the metal housing/frame must be smooth and clean.
- The RFID readers/writers must be installed in a housing with wall thickness 2-7 mm.
- The RFID readers/writers can only be installed in areas with a low risk of mechanical danger.
- The USB/RS232 cable must be secured with the supplied cable ties and adhesive socket. You can only remove or connect the USB/RS232 cable when the power supply is switched off or when the device is in an area without flammable gas or dust concentrations.
- The RFID readers/writers should only be cleaned with a damp cloth.
- The RFID readers/writers cannot be installed close to charge-generating processes.
- EPL Gc: The RFID readers/writers can only be installed in housings with ingress protection of at least IP54 in accordance with EN 60079-0.
- EPL Dc: The RFID readers/writers can only be installed in housings with ingress protection of at least IP6X in accordance with EN 60079-0.
- EPL Gc: It has to be guaranteed that the transient protection is set to a value that does not exceed 140% of the measured peak voltage value at the USB/RS232 cable of the housing.

After installation of the reader, a label with the following content must be affixed next to the reader:

SIEMENS
SIMATIC RF1060R or SIMATIC RF1070R



II 3 G

II 3 D

Warning - Danger due to electrostatic discharge - see instruction manual

A.2 Ordering data

Table A- 2 Ordering data

Product	Article number
SIMATIC RF1040R	6GT2831-6CA50
SIMATIC RF1060R	6GT2831-6AA50
SIMATIC RF1070R	6GT2831-6BA50

Table A- 3 Ordering data accessories

Product	Article number
Card holder for RF1000	6GT2890-0CA00
Configuration card	6GT2300-0CC00-0AX0
Power supply unit LOGO! Power 5 V / 3 A	6EP3310-6SB00-0AY0
Optional USB connecting cable	0.5 m 6GT2891-0UE50
RS232 connecting cable for connection to RF170C M12 ↔ PicoBlade	2.0 m 6GT2891-4UH20
RS232 connecting cable Open cable end ↔ PicoBlade	3.0 m 6GT2891-2UH30

Service & Support

Industry Online Support

In addition to the product documentation, you are supported by the comprehensive online information platform of Siemens Industry Online Support at the following Internet address:

Link: (<https://support.industry.siemens.com/cs/de/en/>)

Apart from news, you will also find the following there:

- Project information: Manuals, FAQs, downloads, application examples etc.
- Contacts, Technical Forum
- The option to submit a support request:
Link: (<https://support.industry.siemens.com/My/ww/en/requests>)
- Our service offer:

Right across our products and systems, we provide numerous services that support you in every phase of the life of your machine or system - from planning and implementation to commissioning, through to maintenance and modernization.

You will find contact data on the Internet at the following address:

Link: (http://www.automation.siemens.com/aspa_app/?ci=yes&lang=en)

RFID homepage

For general information about our identification systems, visit RFID homepage (<http://w3.siemens.com/mcms/identification-systems/>).

Online catalog and ordering system

The online catalog and the online ordering system can also be found on the Industry Mall Homepage (<https://mall.industry.siemens.com>).

SITRAIN - Training for Industry

The training offer includes more than 300 courses on basic topics, extended knowledge and special knowledge as well as advanced training for individual sectors - available at more than 130 locations. Courses can also be organized individually and held locally at your location.

You will find detailed information on the training curriculum and how to contact our customer consultants at the following Internet address:

Link: (<https://new.siemens.com/global/en/products/services/industry/sitrain.html>)

