Logging User Data by means of RFID (Set 13)

SIMATIC S7-1200 + RF120C
Extension of Set 6

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Table of Contents

1 Task

Note

This set is an extension of set 6 (quality assurance by means of weighing, control and logging).
A RFID reader is to be connected to set 6. The packaged goods from set 6 are provided with a transponder on which the product information can be written and also read out.

Further information on set 6 (quality assurance by weighing, control and logging can be found in entry ID 82454336.

Introduction

In the packaging industry, containers, provided with RFID transponders are to be filled with a specified number of pieces (e.g. of wall anchors), calculated by weight control.

The goods to be packaged are selected via recipes.

After finishing the packaging, a quality assurance takes place.
The packaged goods will pass the quality control if the filling weight is within the tolerance to be observed (specified in the recipe), if not, it will not pass.

In the course of this quality assurance measure, the goods are to be clearly identified and all relevant data, including time stamp are to be logged.

Through a connected RFID reader, the log data is to be additionally written onto the transponder on the containers for later tracking.

The unique serial number UID (unique identifier) of the transponder is to be read out and written into the logging of the process data (DataLog).

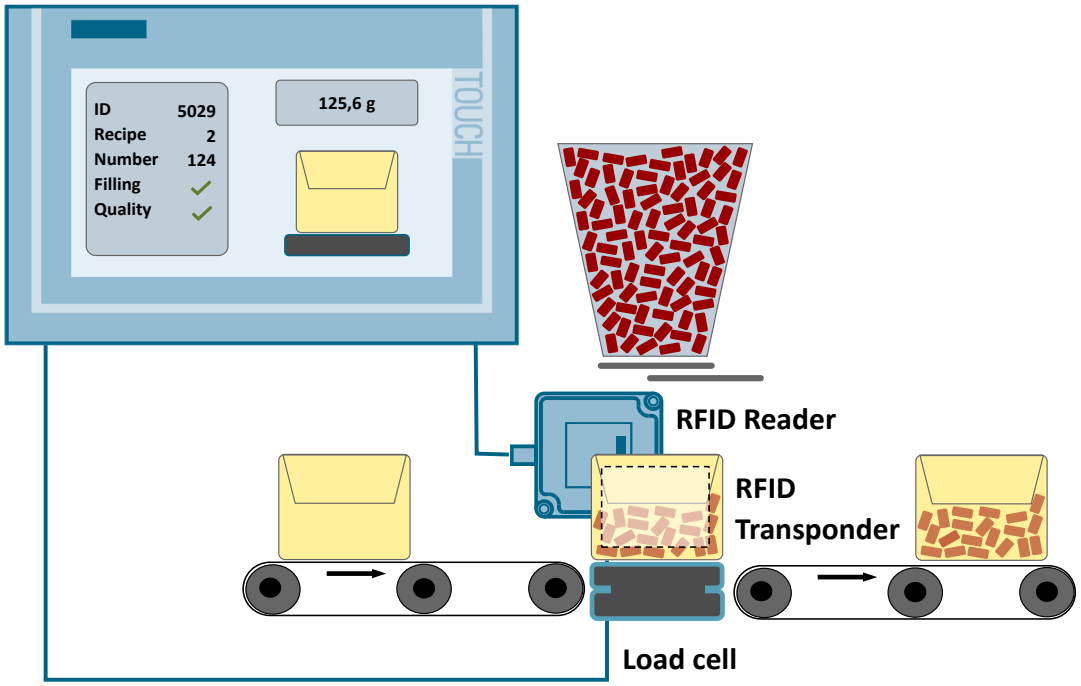
However, the filling process also has to be guaranteed when the transponder in not detected and the produced goods are to be transported and the RFID access error signaled.

The RFID functionality is to be controlled manually even without filling process.

Overview of the automation task

The figure below provides an overview of the automation task.

Figure 1-1



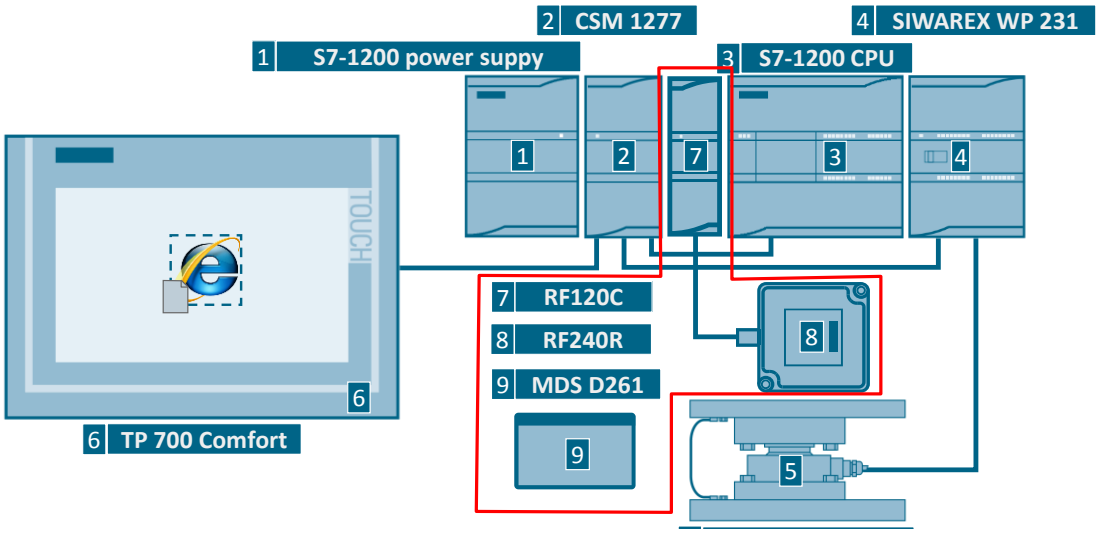
2 Solution

2.1 Overview

Schematic layout

The figure below shows a schematic overview of the most important components of the solution:

Figure 2-1



Set 6 uses an **S7-1200 controller** and the SIWAREX MS weighing module WP231 with WL260 load cell. The weight value of the goods to be packaged is detected and compared with a reference value of one of the recipe data. After filling, it is checked whether all components are complete. The packaged goods can be clearly identified by a batch number.

The DataLog function of the **S7-1200 controller** makes it possible to log the currently measured weight values with a time stamp in the flash memory of the CPU.

The application example can be operated and monitored via the **TouchPanel** TP 700 Comfort.

The communication between controller, HMI and programming device takes place through the **Ethernet Switch CSM 1277**.

With the help of the extension set, the UID of the **MDS D261 transponder** on the packaging is read out by means of the communication module RF120C and the RFID reader RF240R and integrated into the process data logging.

In addition to the recipe data with time stamp of the filling, weight and quality assurance written in the load memory of the controller for logging, this information is also written in the transponder on the packaged goods.

The user data can also be edited without weighing technology extension in manual mode, written on the transponder and read out again.

Application areas

The SIMATIC S7-1200 controller with the RF120C communication module was developed for all simple controller tasks with identification jobs.

The design technology of the S7-1200 is designated for the control cabinet with protection class IP 20.

Main area of application for the SIMATIC RF120C:

- Mechanical engineering, automation systems, conveyor technology
- Auxiliary assembly lines in the automotive industry/suppliers
- Small assembly lines
- Food and packaging industry

Advantages

- With the RF120C all Siemens RFID and code reading systems can be operated directly and very easily on the S7-1200.
- Together with RF200 readers this results in an economical and yet powerful identification solution.
- Fast and simple configuration via TIA Portal V14
- Automated identification solution for tracking and further processing in industrial production
- Direct communication via the backplane bus between CPU and RF120C communication module (no bus connection required)
- The reader connected to the RF120C communication module is selected via the device view in the TIA Portal (none further configuration required)

Topics not covered by this application

This application example focusses on data logging and acquisition by means of RFID. The data of the filling is written on the containers and read out again.
It is assumed that the transponder is already located on the container.

This application example does not contain a description of:

- Labeling of the container with adhesive transponders

Assumed knowledge

Basic knowledge of SIMATIC S7-1200 and the TIA Portal is assumed.

2.2 Hardware and software components

2.2.1 Validity

This application example is valid for

- STEP 7 V14 (\9\) Update 2 (\11\)
- WinCC Comfort V14 (\10\) Update 2 (\11\)
- CPU 1214C Firmware V4.2 (\12\)

2.2.2 Components used

The application example has been created with the following components:

Hardware components

Table 2-1

Component	Qty.	Article number	Note
PM 1207 power supply	1	6EP1332-1SH71	Supplies the components with 24V DC
CSM 1277	1	6GK7277-1AA10-0AA0	Ethernet switch
CPU 1214C DC/DC/DC	1	6ES7214-1AG40-0XB0	S7-1200 controller Firmware: V4.2.1 (\12\)
SIWAREX WP 231	1	7MH4960-2AA01	Weighing module Firmware: V3.1.1 (\17\)
SIWAREX WL 260 load cell	1	7MH5102-1KD00	Rated load: 3 kg
SIMATIC HMI TP700 Comfort	1	6AV2124-0GC01-0AX0	Operator panel
RFID communication module RF120C for SIMATIC S7-1200	1	6GT2002-0LA00	Firmware: V1.0.0 1 reader connectable via RS422
Connecting cable between RF120C and RFID reader	1	6GT2091-4LH20	can be assembled, Length 2 m
SIMATIC RF200 READER RF240R	1	6GT2821-4AC10	With RS422 interface and integrated antenna
HF LABEL MDS D261 FOR RF200/ RF300 ISO/ MOBY D	Minimum order quantity: 1000	6GT2600-1AA01-0AX0	ISO adhesive, 256 BYTE user memory; Dimensions (L x W x H) 55 x 55 x 0.3 mm

Accessories

Table 2-2

Component	Qty.	Article number	Note
SIMATIC NET, INDUSTRIAL ETHERNET TP CORD RJ45/RJ45, CAT 6, TP CABLE 4X2, PREPARED WITH 2 RJ45 CONNECTORS, … 0.5M 1M 2M 6M 10M	4	6XV1870-3Q… …E50 …H10 …H20 …H60 …N10	Ethernet cable
Standard mounting rail 35mm	1	6ES5 710-8MA11	483 mm

Software components

Table 2-3

Component	Qty.	Article number	Note
STEP 7 Basic V14	1	6ES7822-0AA04-0YA5	Configuration and programming of the SIMATIC S7-1200
WinCC Comfort V14	1	6AV2101-0AA04-0AA5	Configuration and programming of the TP 700 Comfort

Example files and projects

The following list includes all files and projects that are used in this example.

Table 2-4

Component	Note
96784939_S7-1200_RF120C_Set13_PROJ_v2d0.zip	This zip file contains the project for TIA Portal V14.
96784939_S7-1200_RF120C_Set13_DOC_v2d0_en.pdf	This document.

3 Basics

This application example is based on set 6 (\16\).
Apart from the RF120C communication module for the SIMATIC S7-1200, the combination from the RFID reader and compatible transponders plays a decisive role. The combinations differ by:

- Technology used/logs of the air interface
- Simultaneous detection of several transponders (multitag) required/reach of the transponder detection (read/write)
- Size of the user memory on the transponder/data transmission rate
- Size of reader and transponder

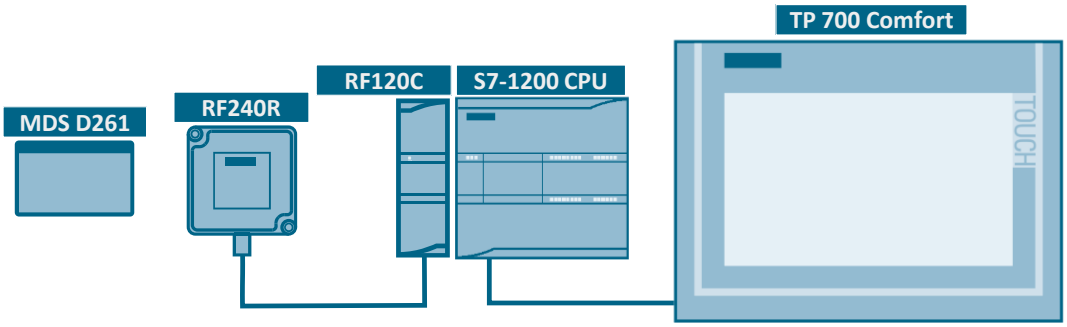
  …

As an economical variant the SIMATIC RF240R reader was selected in connection with the adhesive SmartLabel transponder MDS D261.
The compatibility of the combination of RFID reader and transponder can be found in the SIMATIC RF Configuration Guide (\5\).

3.1 Communication module SIMATIC RF120C

The SIMATIC RF120C is a communication module for the direct connection of the SIMATIC Identif systems to the S7-1200.
All RFID systems as well as the MV400 code reader system can be operated on the SIMATIC RF120C.

Figure 3-1



Only one reader or one code reading device can be operated with a RS422 interface on a RF120C communication module.
Thus, a S7-1200 CPU each can be operated with a maximum of 3 readers (3 communication modules RF120C with one reader each).
RFID and code reading device from the following product families can be operated with the RF120C:

- RF200
- RF300
- RF600
- MV400 code reading devices
- MOBY D
- MOBY U

Further information on the RF120C communication module can be found in the SIMATIC Ident RFID communication module RF120C (\8\).

A library with newly developed instructions (function blocks) allows for simple programming and commissioning in the TIA Portal (\6\).

3.2 RFID Reader RF240R

The SIMATIC RF240R reader is a reader with integrated antenna.
Its compact design makes it especially suitable for the use in small assembly lines.
It is supplied with voltage from the RF120C communication module.

The reader has an optional RS422 or RS232 interface.
For the connection to the RF120C communication module the variant with the RS422 interface is selected.

Due to its high protection type (protection type IP67) and robust design technology, the reader enables the SIMATIC RF240R for trouble-free use even under the toughest industrial conditions. The connection will be realized via an 8-pole M12 connector.

The RF240R has a 2-color LED via which operator voltage, presence and errors are signaled. The errors can be acknowledged with the respective configuration settings of the RF120C via the “Reset_Reader” function block (see chapter 5.2).

The reader is operated with ISO 15693 compatible transponders and supports the single tag mode (only one transponder may be located in the detection range of the reader).

For more information on the RFID reader RF240R please refer to \7\.

3.3 ISO transponder MDS D261

The MDS D261 is a SmartLabel transponder (self-adhesive label).
It can be used for the MOBY D RFID system as well as for the SIMATIC RF200 and SIMATIC RF300 (ISO mode).

SmartLabels allows for a variety of flexible constructions to guarantee ideal dimensioning for the various applications.

Being very economically priced, SmartLabels can generally be used as “electronic barcode substitute” or “accompanying documents”.

In connection with the RFID reader RF240R the MDS D261 transponder is detected at a distance of 2…60 mm (\5\).

It has a 256 bytes EEPROM user memory.
Apart from this freely available memory area for user data, each ISO transponder chip has a unique 8 byte serial number (UID, read only).

Table 3-1

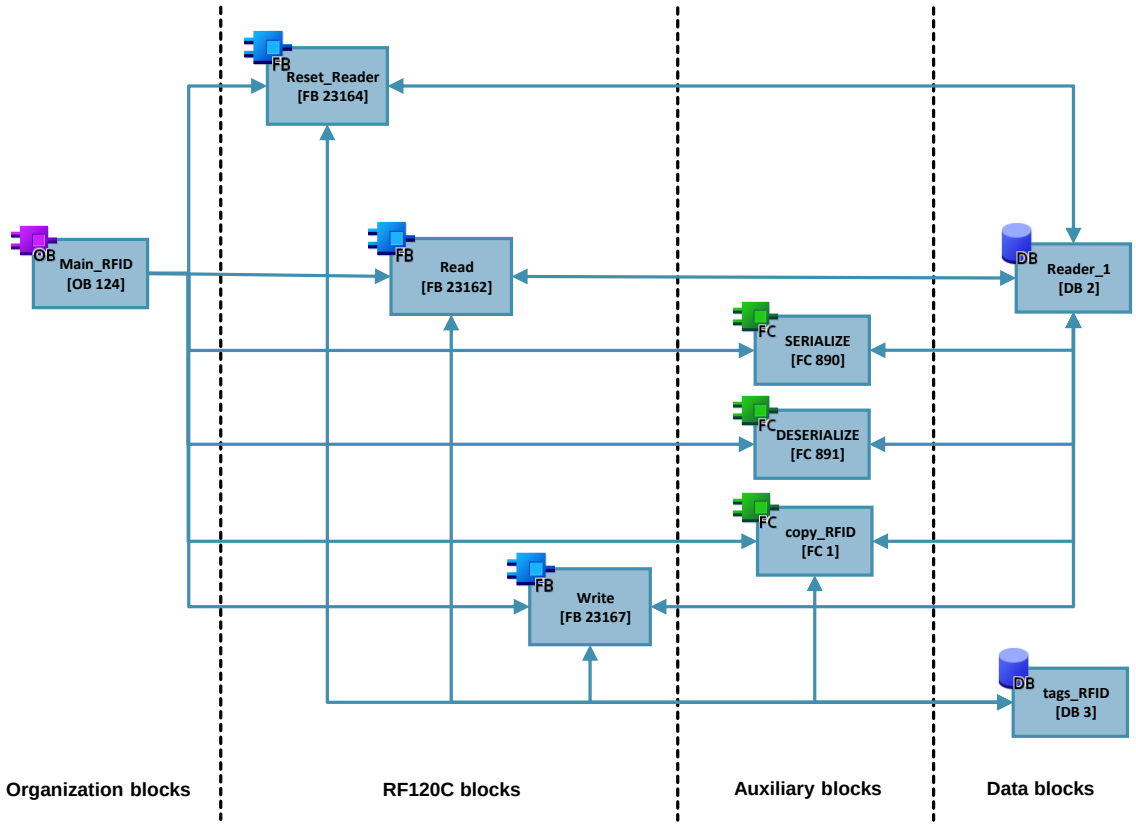
Memory area	Size	Start address	End address	Access
UID	8 byte	FFF0	FFF8	Read only
User area	256 byte	0000	00FF	EEPROM (read/write)

4 Mode of Operation

Below, the blocks used are introduced and the most important interface parameters are described.

4.1 General overview

Figure 4-1



4.2 Organization block

The organization block determines the processing sequence of the instructions and transfers the tags from the data blocks to the block interfaces.

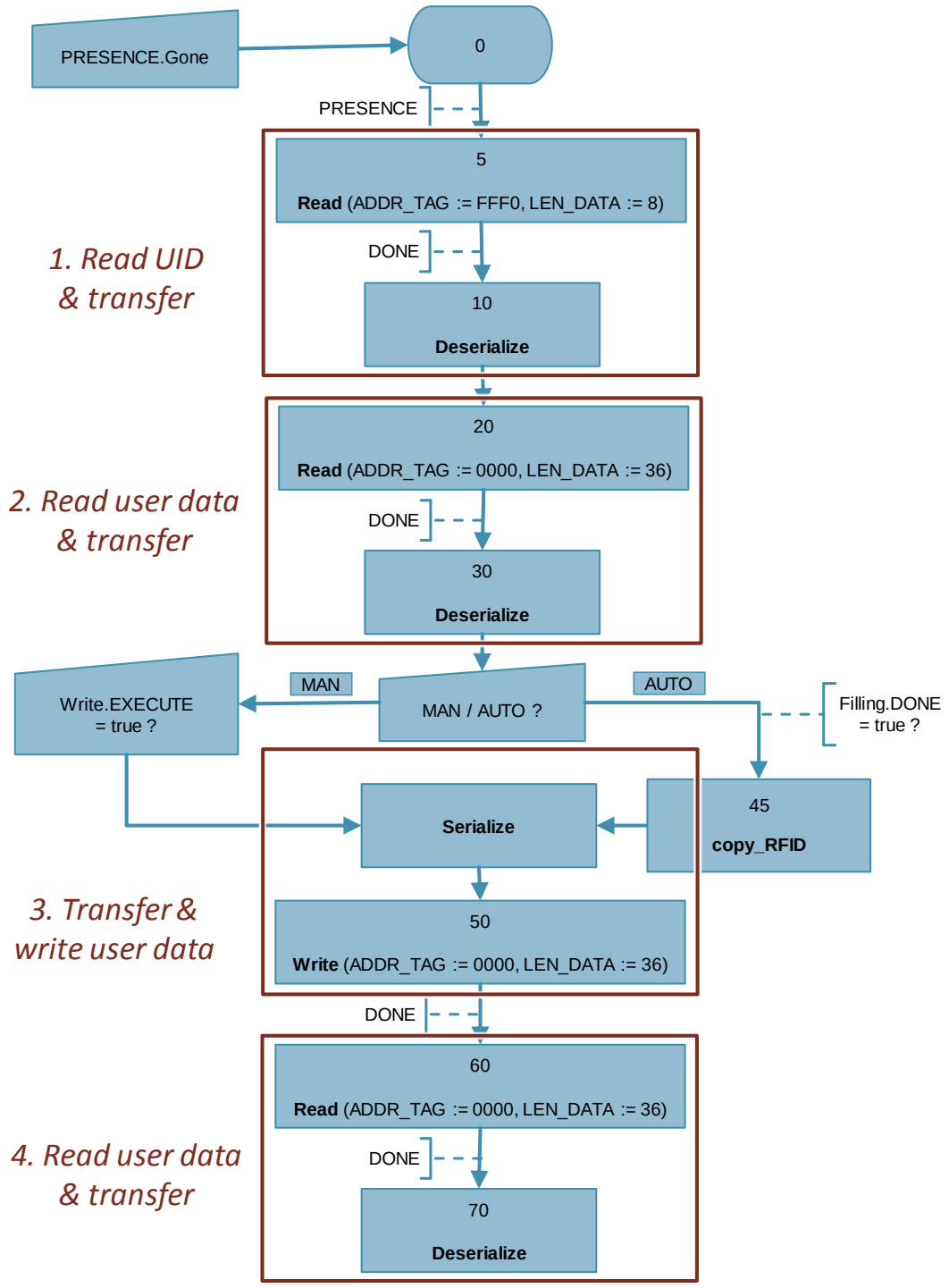
4.2.1 “Main_RFID” OB

The function blocks for the RF120C communication module, as well as the auxiliary blocks. are called from the “Main_RFID” OB.

Program flow chart

The OB “Main_RFID” is programmed as a sequence. The program flow chart is as follows.

Figure 4-2



The sequence consists of 4 accesses on the transponder:

1. Reading the UID and copying the data (when detecting the transponder)
2. Reading the user data area and interpreting the data
3. Copying the user data to be written and writing to the transponder
4. Repeated reading out of the user data area to check the successful write process

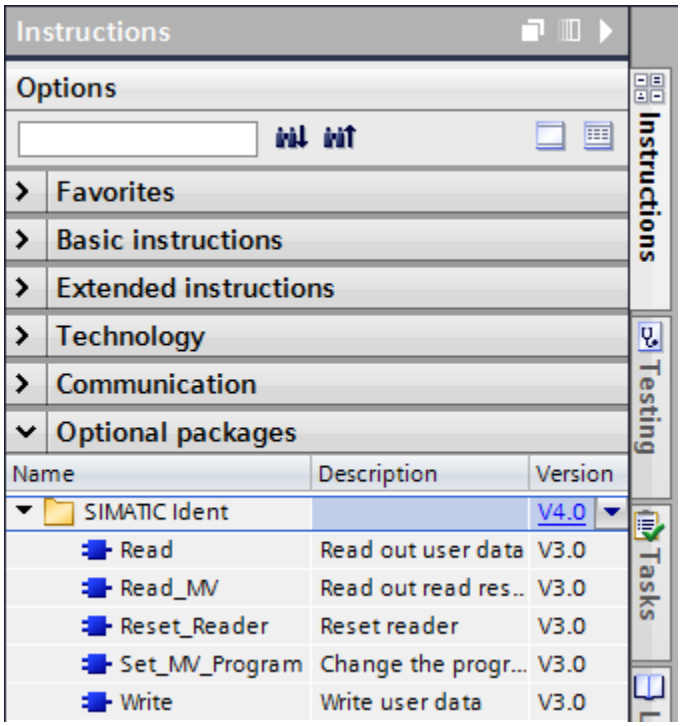
Depending on the selection of manual or automatic mode, you can edit the user data to be written via the operator panel or it can be automatically generated via the “copy_RFID” function from the filling process of set 6.

The sequence is reset as soon as the transponder is removed from the detection range of the reader.

4.3 RF120C Ident blocks

The ident blocks used in this application example can be found in STEP 7 (TIA Portal) as of V14 in the instructions in “Optional packages > SIMATIC Ident”:

Figure 4-3



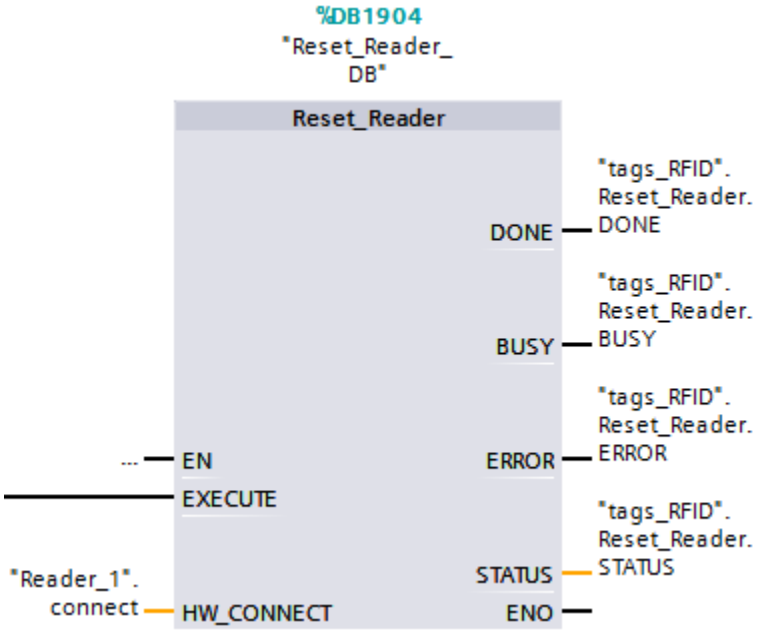
The following ident blocks are needed in this application example to operate the RF120C RFID reader:

- "Reset_Reader" FB 1904 for the initialization when commissioning and resetting the reader in the event of a fault
- “Read” FB 1902 for reading out of the transponder information
- “Write” FB 1906 for writing on the transponder via the RFID reader
- "Ident_Profile" FB 1900 (it represents the complex control block for all ident systems and is automatically integrated into the project when a RFID function block is used)

4.3.1 “Reset_Reader” FB

With the help of the "Reset_Reader" FB the RFID reader RF120C is reset.
In the process, the reader is reset to the settings that are stored in the device configuration of the RF120C (see chapter 5.2).

Figure 4-4



Interface

Table 4-1

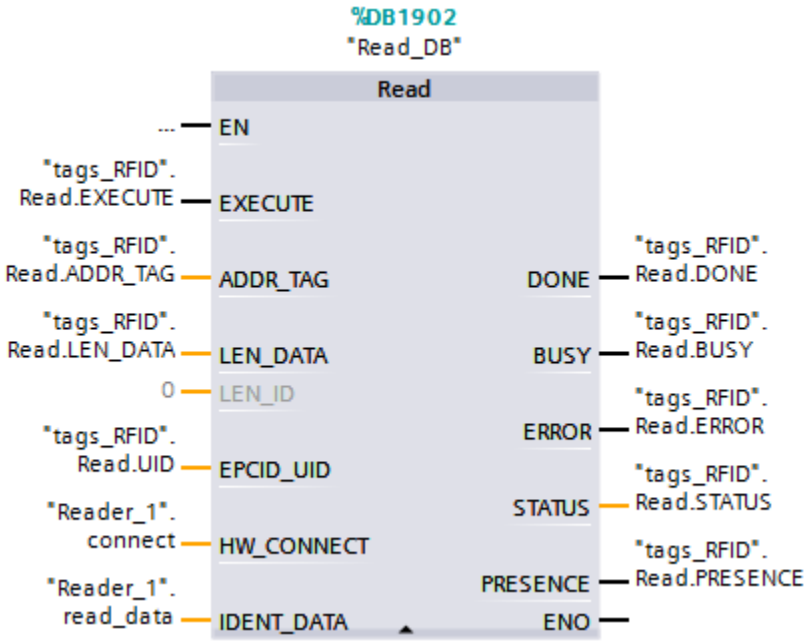
	Name	Data type	Description
Input	EXECUTE	Bool	Rising edge: Command start
Output	DONE	Bool	Error-free execution*
	BUSY	Bool	Command processing
	ERROR	Bool	Error signaling*
	STATUS	DWord	Hexadecimal error code (valid in connection with ERROR = true)* \6\
InOut	HW_CONNECT	"IID_HW_CONNECT"	PLC data type for channel addressing (see chapter 4.5.1)

*) keep their value as long as EXECUTE is set or for one cycle, if EXECUTE was reset before completing the block

4.3.2 "Read” FB

The “Read" block reads the data from the transponder once and provides it in the "IDENT_DATA" buffer. The physical address and the length of the data are transferred via the parameters “ADDR_TAG" and "LEN_DATA”. A maximum of 1024 byte can be read with one job.

Figure 4-5



Interface

Table 4-2

	Name	Data type	Description
Input	EXECUTE	Bool	Rising edge: Command start
	ADDR_TAG	DWord	Physical address on the transponder, from which on it is read
	LEN_DATA	Word	Length of the data to be read (1...1024 bytes)
	LEN_ID	Byte	Length of EPC ID/UID
	EPCID_UID	Array[1..62] of Byte	Unique identifier of the transponder RF240R can only do single tag mode (UID = 0).
Output	DONE	Bool	Error-free execution*
	BUSY	Bool	Command processing
	ERROR	Bool	Error signaling*
	STATUS	DWord	Hexadecimal error code (valid in connection with ERROR = true)* \6\
	PRESENCE	Bool	Transponder presence
InOut	HW_CONNECT	"IID_HW_CONNECT"	PLC data type for channel addressing (see chapter 4.5.1)
	IDENT_DATA	Variant	Data buffer where the read data is stored

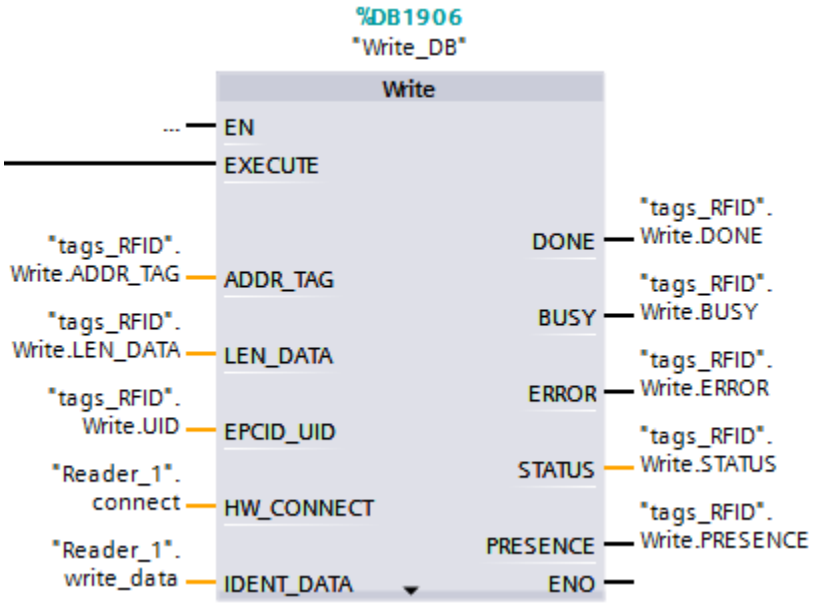
*) keep their value as long as EXECUTE is set or for one cycle, if EXECUTE was reset before completing the block

4.3.3 "Write" FB

The "Write" block writes the data once from the "IDENT_DATA" buffer onto the transponder. The physical address and the length of the data are transferred via the parameters "ADDR_TAG" and "LEN_DATA". A maximum of 1024 byte can be

written with one job.

Figure 4-6



Interface

Table 4-3

	Name	Data type	Description
Input	EXECUTE	Bool	Rising edge: Command start
	ADDR_TAG	DWord	Physical address on the transponder, from which on it is written
	LEN_DATA	Word	Length of data to be written (1 ... 1024 byte)
	LEN_ID	Byte	Length of EPC ID/UID
	EPCID_UID	Array[1..62] of Byte	Unique identifier of the transponder RF240R can only do single tag mode (UID = 0).
Output	DONE	Bool	Error-free execution*
	BUSY	Bool	Command processing
	ERROR	Bool	Error signaling*
	STATUS	DWord	Hexadecimal error code (valid in connection with ERROR = true)* \6\
	PRESENCE	Bool	Transponder presence
InOut	HW_CONNECT	"IID_HW_CONNECT"	PLC data type for channel addressing (see chapter 4.5.1)
	IDENT_DATA	Variant	Data buffer with data to be written

*) keep their value as long as EXECUTE is set or for one cycle, if EXECUTE was reset before completing the block

Note Further information on the blocks used can be found in the function manual "SIMATIC Ident RFID systems Ident profile and Ident blocks, standard function for Ident systems" (\6\).

4.4 Auxiliary blocks

The following auxiliary blocks are used in the application example:

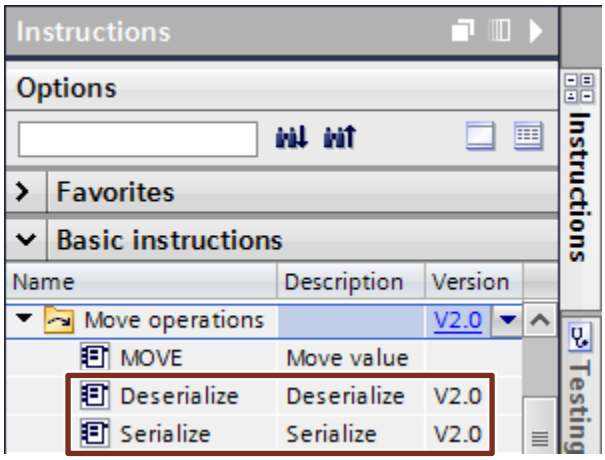
- “Serialize” FC 890 to copy the user data in an array of byte
- “Deserialize” FC 891 to copy the received data (Array of Byte) in the user data to be interpreted
- “copy_RFID” FC 1 to collect all relevant user data that are to be written on the transponder

4.4.1 "Serialize“ / “Deserialize” functions

The “IDENT_DATA” data buffer of the communication blocks “READ” and “WRITE” are designed as variant data types and need an array of byte as transfer. In order to bring the user data into this form, the "Serialize" FC is required before writing the RFID data. To convert the transponder data received as array of byte into comprehensible user data, the user example uses the "Deserialize” FC.

The functions “Deserialize” and “Serialize” can be found in STEP 7 (TIA Portal) in the instructions in “Basic instructions > MOVE”:

Figure 4-7

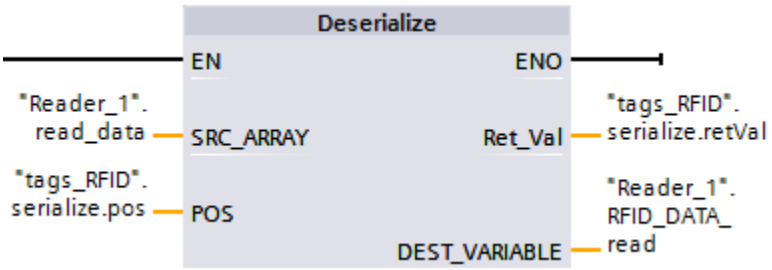


Note In contrast to previous versions, instructions used as of version V2.0 also allow access to optimized memory areas.

“Deserialize” FC

The "Deserialize" instruction converts the sequential representation of data (array of byte) into a PLC data type.

Figure 4-8



Interface

Table 4-4

	Name	Data type	Description
Input	SRC_ARRAY	Variant	Variable of the ARRAY of BYTE data type in which the data stream created is saved
InOut	POS	DInt	The operand on the “POS” parameter saves the index of the first byte according to the number of bytes that the converted customer data occupies.
Output	RET_VAL	Int	Error information
	DEST_VARIABLE	Variant	Variable, in which the reconverted PLC data type (UDT), STRUCT, ARRAY of <data type> is saved

The call of the "Deserialize" instruction is done in the application example in connection with the RFID instruction “Read”.
In the case presented in Figure 4-9, for example, the read out “read_data” user data is copied from the transponder into the “RFID_DATA_read” data structure of the “UDT_RFID_DATA” PLC data type (OB “Main_RFID” network 8):

Figure 4-9

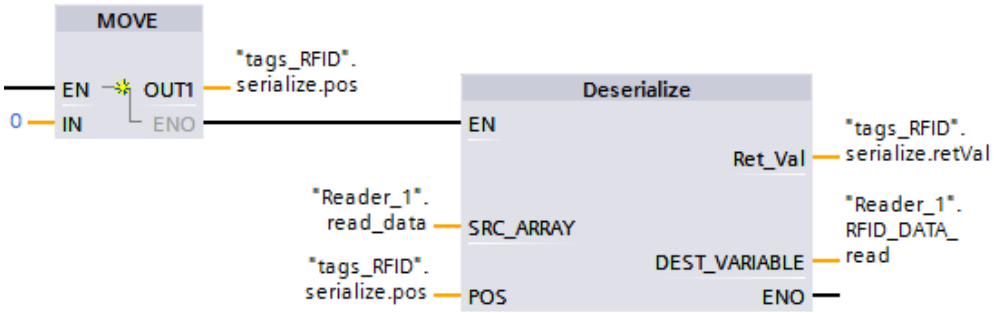
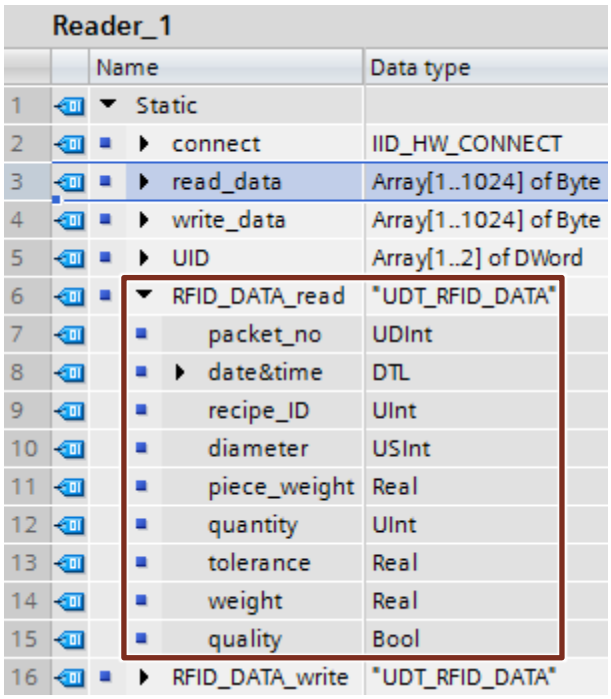


Figure 4-10



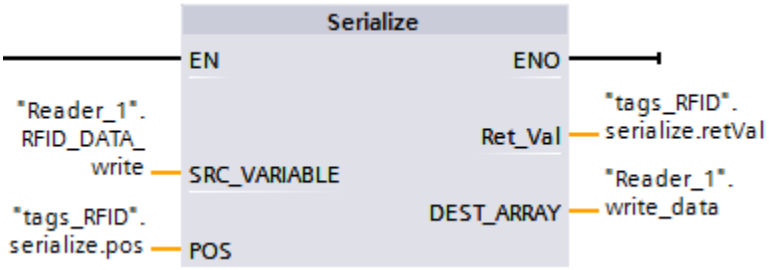
The operand on the “POS” parameter has to be initiated before the call of the instruction (“POS” = 0, see Figure 4-9), in which place the data is to be written in “DEST_VARIABLE”. After the processing of “Deserialize”, “POS” indicates the first digit after the written data in “DEST_VARIABLE”.

Note A precise description of the “Deserialize” instruction can be found in the system manual for STEP 7 Basic V14 (\13\) or in the TIA Portal help via F1.

“Serialize” FC

The "Serialize" instruction enables you to convert structured data (e.g. PLC data types) in a sequential form of representation (e.g. ARRAY of Byte), without losing parts of your structure.

Figure 4-11



Interface

Table 4-5

	Name	Data type	Description
Input	SRC_VARIABLE	Variant	PLC data type (UDT), STRUCT, ARRAY of <data type>, which is converted in a sequential form of representation.
InOut	POS	DInt	The operand on the “POS” parameter saves the index of the first byte according to the total number of bytes that the converted customer data occupies.
Output	RET_VAL	Int	Error information
	DEST_ARRAY	Variant	Array in which the created data current is saved.

The call of the “Serialize" instruction is done in the application example in connection with the RFID instruction “Write”.
The "RFID_DATA_write" user data of the "UDT_RFID_DATA” PLC data type in Figure 4-12 is copied in a “write_data” array of byte that is comprehensible for “Write” FB (“Main_RFID” OB network 11):

Figure 4-12

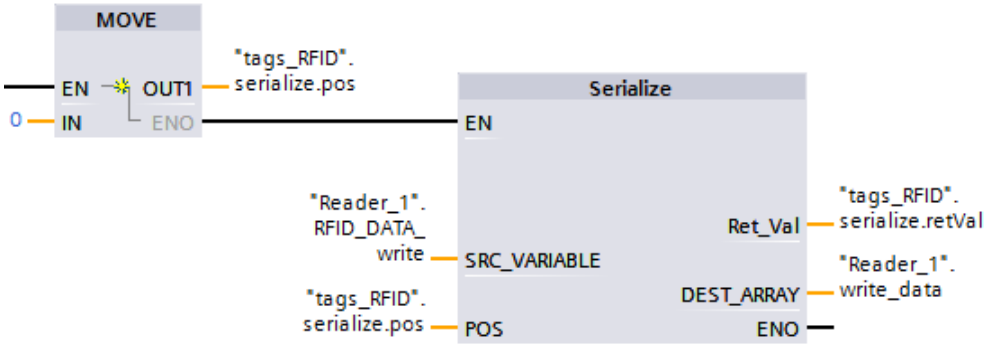
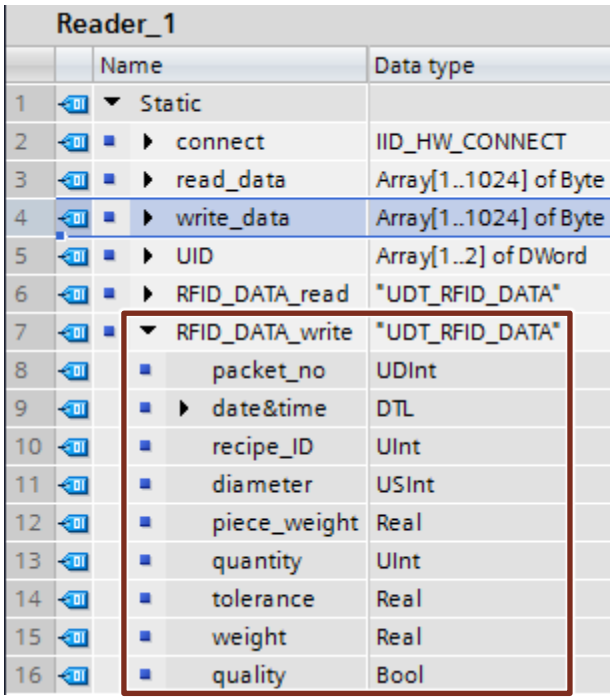


Figure 4-13



Reader_1

		Name	Data type
1		Static	
2		connect	IID_HW_CONNECT
3		read_data	Array[1..1024] of Byte
4		write_data	Array[1..1024] of Byte
5		UID	Array[1..2] of DWord
6		RFID_DATA_read	"UDT_RFID_DATA"
7		RFID_DATA_write	"UDT_RFID_DATA"
8		packet_no	UDInt
9		date&time	DTL
10		recipe_ID	UInt
11		diameter	USInt
12		piece_weight	Real
13		quantity	UInt
14		tolerance	Real
15		weight	Real
16		quality	Bool

The operand on the “POS” parameter has to be initiated before the call of the instruction (“POS” = 0, see Figure 4-12), in which place the data is to be written in “DEST_ARRAY”. After the processing of “Serialize”, “POS” indicates the first digit after the written data in “DEST_ARRAY”.

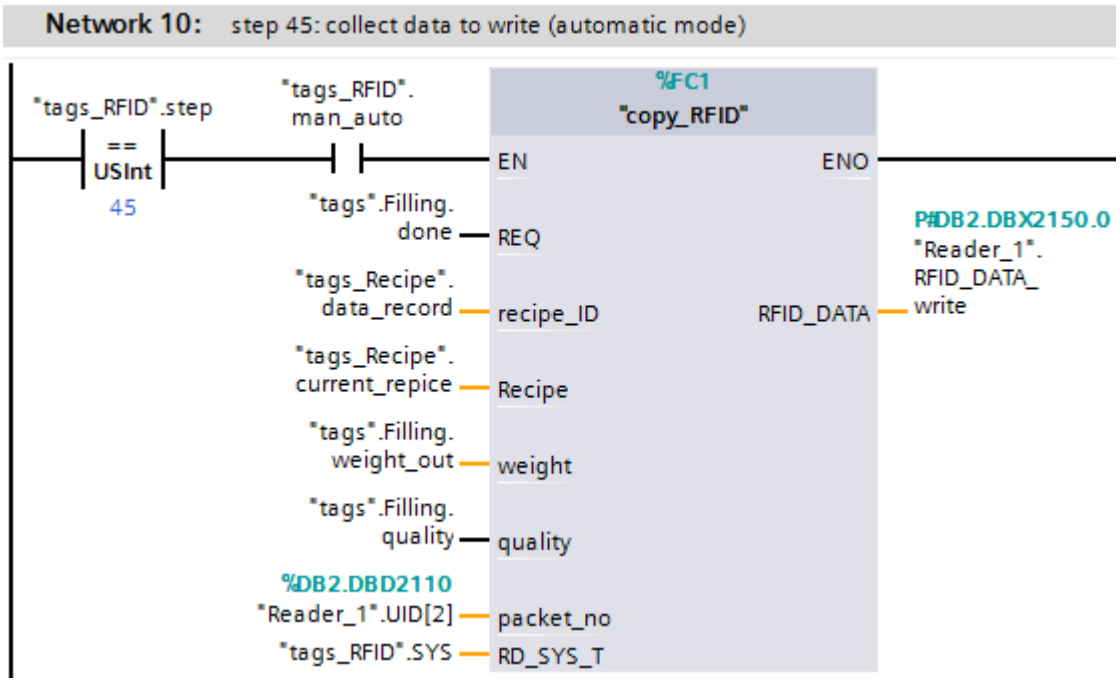
Note A precise description of the "Serialize" instruction can be found in the system manual for STEP 7 Basic V14 (\13\) or in der TIA Portal Help with F1.

4.4.2 “copy_RFID” function

The “copy_RFID” FC collects all required user data that is to be written on the transponder in automatic mode and stores it in a data buffer. It consists of the data that is recorded at the process value logging via DataLogging and the time stamp of the recording.

The call of the “copy_RFID” FC is done in OB “Main_RFID”.

Figure 4-14



Interface

Table 4-6

	Name	Data type	Description
Input	REQ	Bool	copy request (enabled when REQ = true)
	recipe_ID	UInt	Recipe ID (identical with the recipe data record number)
	Recipe	"UDT_Wall_anchors"	Recipe data (see Table 4-7)
	weight	Real	Filled weight
	quality	Bool	Quality of filling
	packet_no	UDInt	Packet number (low-order DWord of the read-out UID in decimal format)
Output	RFID_DATA	"UDT_RFID_DATA"	Summary of the RFID data to be written (see Table 4-8)
InOut	RD_SYS_T • SYS_T • RET_VAL	Struct DTL Int	Output variable of the “RD-SYS_T” instruction (read time)

"UDT_Wall_anchors” PLC data type

The "UDT_Wall_anchors" PLC data type includes the elements of a recipe data record.

Table 4-7

Name	Data type	Description
productname	String[20]	Name of the recipe data record
diameter	USInt	Wall anchor diameter in mm

Name	Data type	Description
quantity	UInt	Pieces
piece_weight	Real	Individual weight (unit depends on the “Quick Start” configuration)
tolerance	Real	Tolerance (unit depends on the “Quick Start” configuration)

"UDT_RFID_DATA” PLC data type

The "UDT_RFID_DATA" PLC data type includes all process data that is to be written onto the transponder.

Table 4-8

Name	Data type	Description
packet_no	UDInt	Packet number (identical with count value of the filling)
date&time	DTL	System time stamp of filling
recipe_ID	UInt	Recipe ID (identical with the recipe data record number)
diameter	USInt	Wall anchor diameter in mm
piece_weight	Real	Individual weight (unit depends on the “Quick Start” configuration)
quantity	UInt	Pieces
tolerance	Real	Tolerance (unit depends on the “Quick Start” configuration)
weight	Real	Filled weight
quality	Bool	Quality of filling

4.5 Data blocks

The following data blocks are used in the application example:

- DB 2 "Reader_1" (FB 12)
- DB 124 “tags_RFID” (DB 10)

4.5.1 “Reader_1” data block

The “Reader_1” data block includes the configuration data for the RC120C communication module as well as the data buffer to read out and write to the transponder.

Table 4-9

Name	Data type	Description
connect	"IID_HW_CONNECT"	Configuration data for transfer to the RFID blocks
read_data	Array[1..1024] of Byte	Receive data buffer for the “Read” FB
write_data	Array[1..1024] of Byte	Send data buffer for the “Write” FB
UID	Array[1..2] of DWord	Unique identifier of the transponder
RFID_DATA_read	"UDT_RFID_DATA"	Read structured user data
RFID_DATA_write	"UDT_RFID_DATA"	Structured user data to be written

"IID_HW_CONNECT” PLC data type

The “IID_HW_CONNECT" PLC data type includes configuration data for the physical addressing of the communication module and reader to be used and servers for the synchronization of the function blocks when accessing the reader (see chapter 5.2).

Table 4-10

Name	Data type	Description
HW_ID	Word	Hardware identifier of the communication module
CM_CHANNEL	Int	Channel selection (RF120C only has one channel; value = 1)
LADDR	DWord	I/O address of the communication module
Static	IID_IN_SYNC	Internal information (not further explained)

Note The “IID_HW_CONNECT” PLC data type is part of STEP 7 (TIA Portal) as of V13 SP1 with the integration of the ident instructions.

Further information on the blocks used can be found in chapter 5.2 in the function manual "SIMATIC Ident RFID systems Ident profile and Ident blocks, standard function for Ident systems" (\6\).

4.5.2 “tags_RFID” data block

The “tags_RFID” data block includes the tags for transmitting the function blocks and functions to the interfaces.

The following table shows the tags that have been provided with deviating start values in the example project.

Table 4-11

Name	Data type	Start value	Description
man_auto	Bool	true	Switch-over bit manual/automatic mode (false = manual mode, true = automatic mode)

4.6 Changes in set 6

To secure the filling process in the event of an incorrect transponder access, the program code of set 6 also has to be adjusted.

The transponder has to be located for long enough in the detection range of the reader to read and write the data but it must not hinder the removal of the filled goods.

4.6.1 "RFID_timer” FB

The “RFID_timer” FB intervenes in the block link between the filling process (FB “Filling”) and the removal (FB “HMI”) or the compilation of the DataLog data (FC “copy”) and is called in the OB 1 “Main”.

After successful filling (Filling.done) a preset time will pass in automatic mode (RFID.man_auto) (here 1 second) in which the RFID sequence has to be processed successfully (RFID.done).

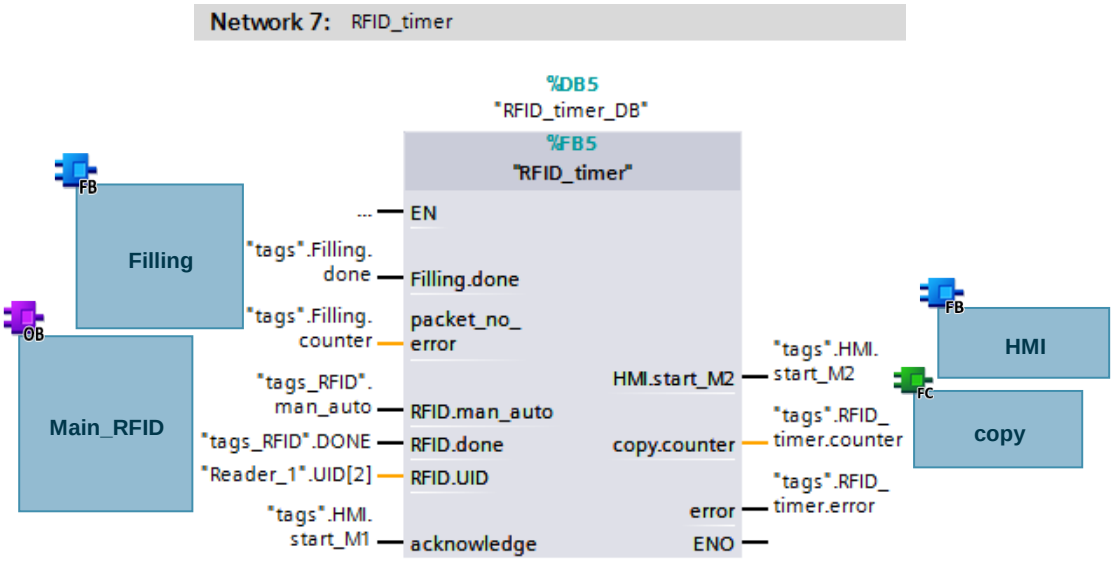
In a positive case the read out UID (RFID.UID) is copied in the DataLogging data record to be written (copy.counter) and “RFID.done” starts the removal of the packet (HMI.start_M2) as well as the recording of the process data.

In a negative case, the specified “packet_no_error” error number (here the count value of the filling) is copied in the DataLogging data record to be written and the

removal of the packet and the recording of the process data starts after the lapsed time. The incorrect access to the transponder is signaled on the “error” output. The “error” output is reset via the “acknowledge” input.

In manual mode (RFID.man_auto = false) the RFID sequence is not time monitored. The RFID transponder is written to manually.
There is no removal and no process data logging by means of DataLogging (HMI.start_M2).

Figure 4-15



Interface

Table 4-12

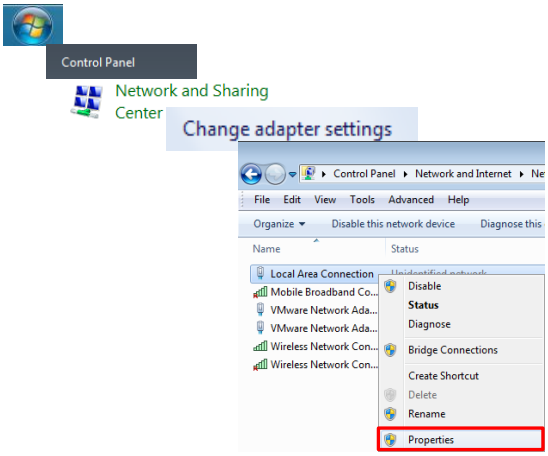
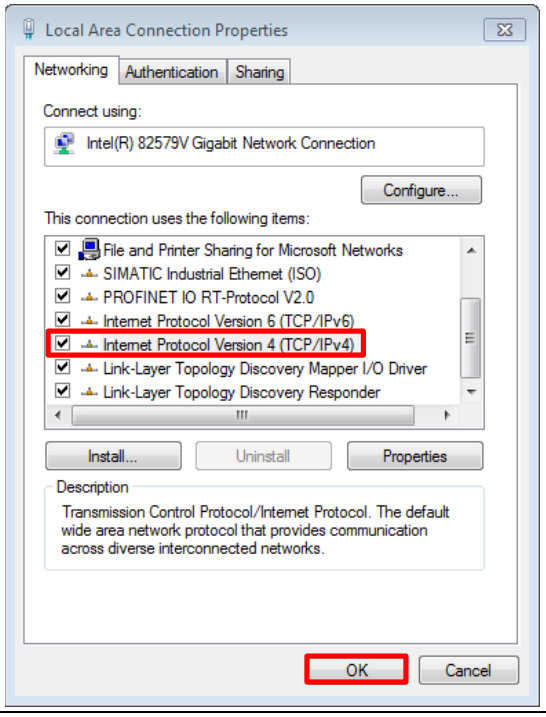
	Name	Data type	Start value	Description
Input	Filling.done	Bool		Successful ending of the filling
	packet_no_error	UDInt	0	Packet no. if the RFID access is incorrect
	RFID.man_auto	Bool		Manual/automatic mode (RFID access)
	RFID.done	Bool		Successful processing of the RFID access
	RFID.UID	UDInt		Low-order DWord of the UID
	acknowledge	Bool		Reset “error” output
Output	HMI.start_M2	Bool		Start request for the removal conveyor belt
	copy.counter	UDInt		Packet no. to be written (DataLog)
	error	Bool		RFID sequence not successfully processed within “time”
Constant	time	Time	1s	Maximum time for processing the RFID sequence

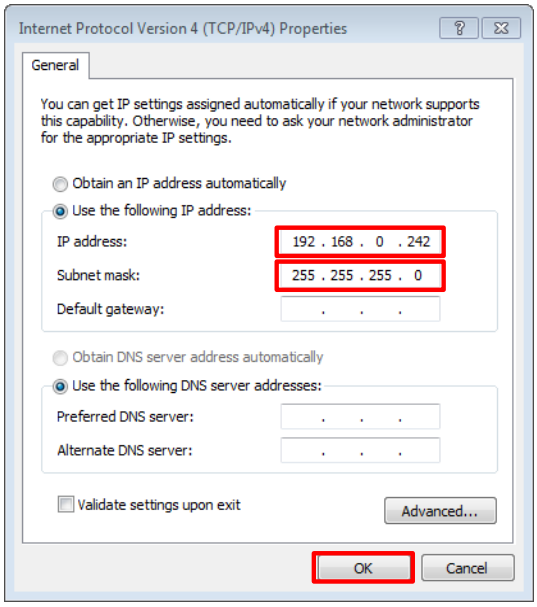
5 Configuration and Settings

5.1 Network connections

The LAN network card of the programming device requires a static IP address to configure the controller and the HMI and to configure the weighing module.
The following table describes the configuration of the LAN connection.

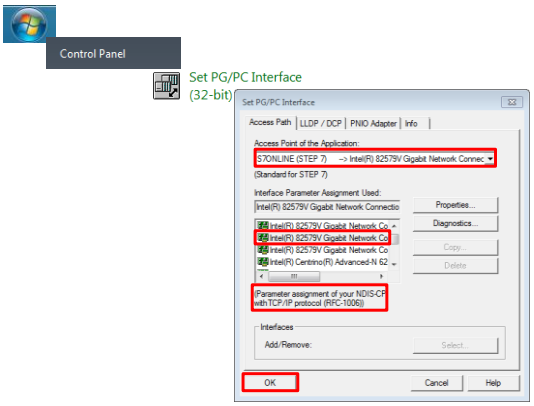
Table 5-1

No.	Action	Remark
1.	Select “Start > Control Panel > Network and Sharing Center > Change adapter settings” to open the network connections. • Select your network connection. • Right-click to open the properties.	
2.	In “Networking”, select the “Internet Protocol Version 4 (TCP/IPv4)” item and open its properties.	

No.	Action	Remark
3.	• Select “Use the following IP address”. • Select an IP address in the CPU’s subnet mask. • Accept the settings by clicking “OK” and “Close”.	

5.1.1 Setting PG/PC interface

Table 5-2

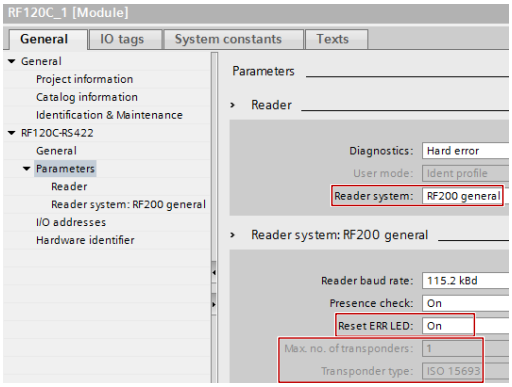
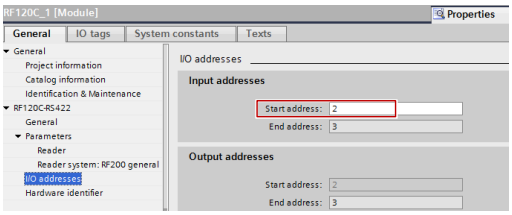
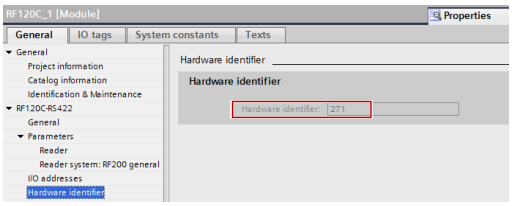
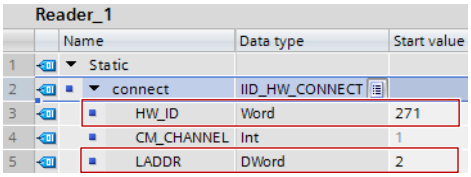
No.	Action	Remark
1.	Open the PG/PC interface settings via “Start > Control Panel” to set the correct access path for STEP 7 V14. • Select “S7ONLINE (STEP 7)” as the application's access point. • Choose “(Assigning Parameters to Your NDIS CPs with TCP/IP protocol (RFC-1006))” to select your network adapter as the interface parameter assignment you are using. Confirm the settings using “OK”.	

5.2 Configuring communication module RF120C

For the configuration you have to accept the settings in the device view of the RF120C communication module and certain settings in the “Reader_1” data block.

Please proceed as follows:

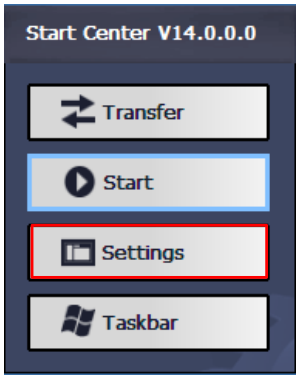
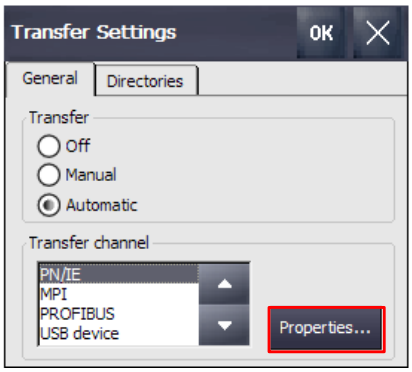
Table 5-3

No.	Action	Remark
1.	• Open the device view of the RF120C communication module in the TIA Portal project. • Specify the connected reader system in “Properties>General>RF120C-RS422>Parameter>Reader” (here “RF200 general”). • Switch on the “Reset ERR LED (of the reader via the FB “Reset_Reader”)” option. • For higher reader systems you also have to specify the number of simultaneously detectable transponders as well as the transponder type used.	
2.	• Open the I/O addresses menu item and read the start address of the input addresses.	
3.	• Open the hardware identifier menu item and read out the hardware address of the RF120C communication module.	
4.	• Enter the hardware identifier (step 3) and the start address (step 2) read out as start values of the parameters “HW_ID” and “LADDR” in the “Reader_1” data block.	

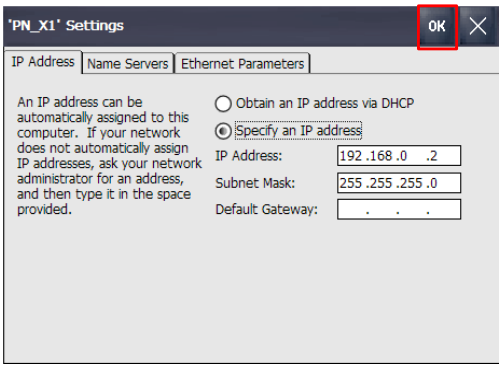
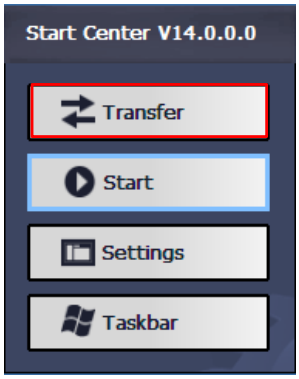
Note Further information on Configuring the "IID_HW_CONNECT" data type can be found in the function manual "SIMATIC Ident RFID systems Ident profile and Ident blocks, standard function for Ident systems" (\6\).

5.3 Configuring SIMATIC Panel TP700 Comfort

Table 5-4

No.	Action	Remark
1.	Provide the TP700 Comfort with 24V.	
2.	Click the “Settings” button in the start center after the initialization phase of Windows CE[1].	
3.	Double-click the transfer icon in the “Control Panel” settings.	
4.	Select the “PN/IE” transmission channel in “Transfer Settings”. Then click the “Properties…” button.	
5.	You will then get to “Network and Dial-up Connections”. Double click the PN_X1 icon.	

[1] The "bootloader" initialization phase is followed by a startup delay interval after which an already loaded application starts. You therefore have to click an action in the loader within the startup delay time.

No.	Action	Remark
6.	Enable the “Specify an IP address” checkbox and accept the displayed settings: • IP address: 192.168.0.2 • Subnet Mask: 255.255.255.0 Finally, accept the settings made in the “PN_X1” and transfer settings with “OK”.	
7.	The transfer mode in the start center has to be enabled to subsequently transfer the HMI project part into the Comfort Panel.	

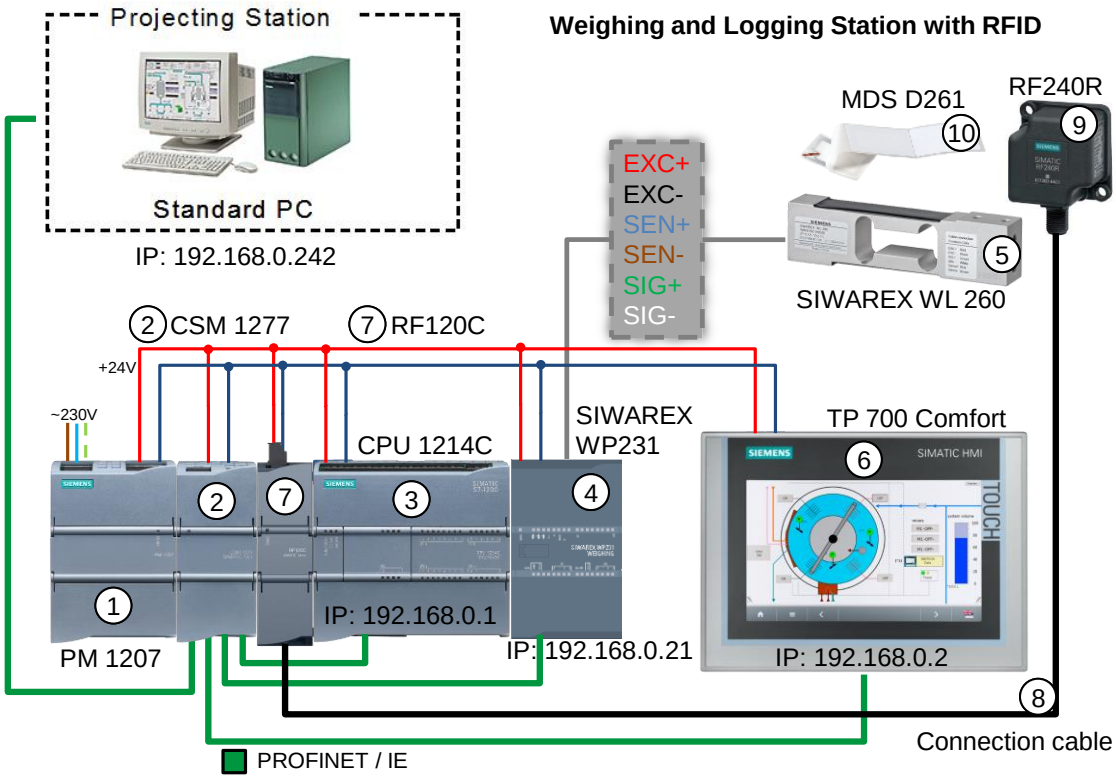
6 Installation and Commissioning

This chapter describes the steps to be taken to commission the application example using the code from the download and the hardware list.

6.1 Installing the hardware

The figure below shows the hardware setup of the application.

Figure 6-1



The set 6 (\16\) is expanded by the components for the RFID connection.

The **CPU 1214C (3)** communicates via the RF120C module (7) and the connecting cable (8) with the RFID reader RF240R (9) and thus reads and writes on the adhesive ISO transponder MDS D261 (10).

The 24V energy supply of the devices is provided by a **PM 1207 (1)**.

A Windows PC with **TIA Portal V14** (STEP 7 Basic V14 and WinCC Comfort V14) is used as configuration device for the S7-1200 controller as well as the **TP 700 Comfort**.

The CSM 1277 switch (2) is used as node for the Ethernet communication between the controller, the TP 700 Comfort **operator panel** (6) and the configuration device.

Table 6-1

No.	Action	Remark
1.	Follow the steps to install the hardware of set 6.	See chapter “Installing the hardware”, source: Set 6 (\16\)
2.	Separate the PM1207 power module from the power supply (230V~).	
3.	Connect the RF120C communication module to the left backplane bus interface of the CPU (after having removed the cover).	see Figure 6-1
4.	Provide the communication module with 24V and ground from the PM1207 power module as well as with PE for shielding.	see Figure 6-1
5.	Install the RFID reader in a way, so that the transponder is located in the detection area of 2 to 60 mm from the RF240R reader.	see "SIMATIC RF Configuration Guide" (\5\)
6.	Connect den .RFID reader via the connecting cable with the RF120C communication module.	see Figure 6-1
7.	Provide the PM1207 power module with the power supply (230V~) again.	
8.	Stick the MDS D261 transponder onto the containers to be filled.	

6.2 Installing the software (download)

This chapter describes the steps for installing the sample code.

Note At this point, it is assumed that the necessary software has been installed on your computer and that you are familiar with the software.

Preliminary remark

For the startup, we offer you software examples with test code and test parameters as a download. The software examples support you during the first steps and tests with set 13. They enable a quick test of hardware and software interfaces between the products described in the set.

The software examples are always assigned to the components used in the set and show their basic interaction. However, they are not real applications in the sense of a technological problem solution with definable properties.

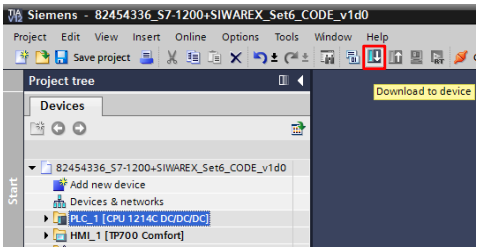
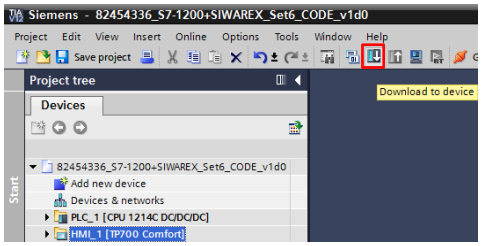
You can operate the project included also as independent RFID application without real SIWAREX connection. The missing module is signaled via the “ERROR” LED to the S7-1200 CPU. However, the RFID functions can still be performed via manual mode (see chapter 7.3.1).

6.3 Downloading the startup code

The software examples are available on the HTML page from which you downloaded this document.

Downloading the TIA Portal project

Table 6-2

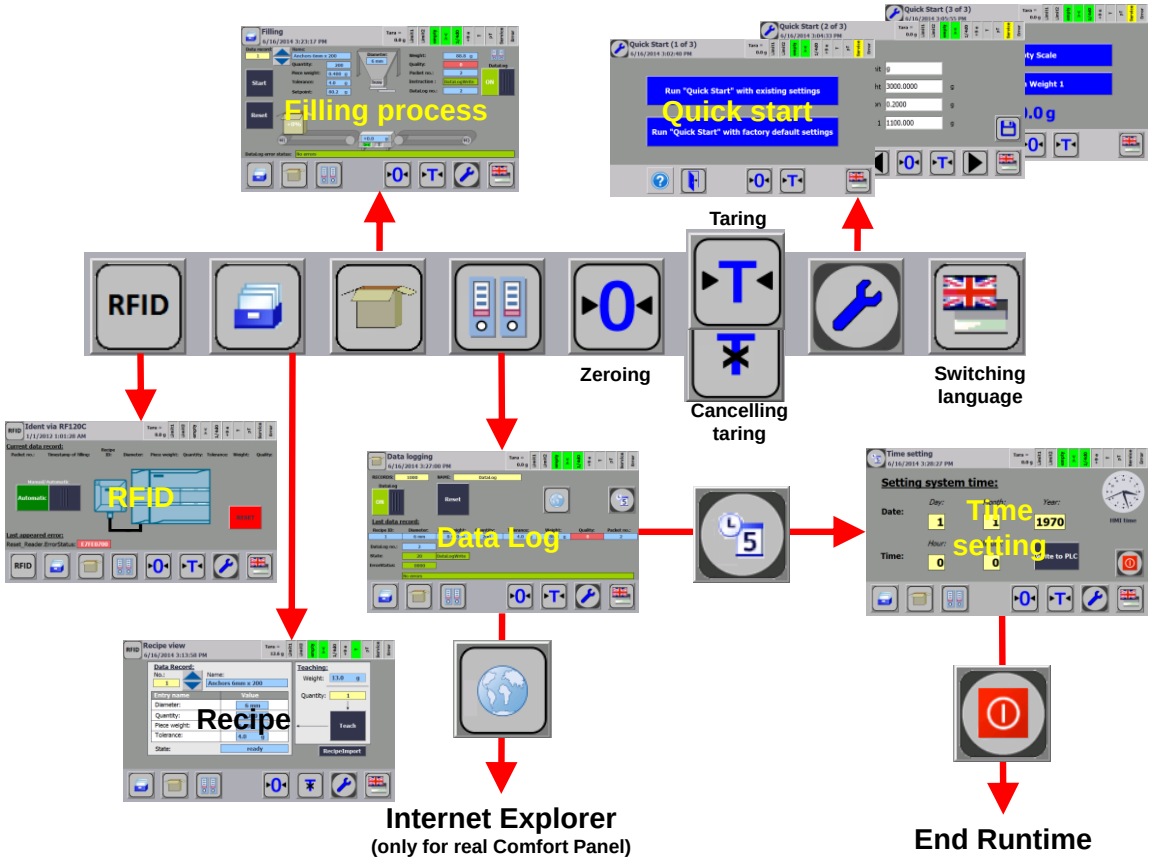
No.	Action	Remark
1.	Unzip and open the project from Table 2-4 using TIA Portal V14.	
2.	Select the “PLC_1” control project folder and confirm the button for loading the CPU.	
3.	Select the project folder for the “HMI_1” operator panel and click the button to load it into the Comfort Panel. Alternatively, you can simulate the TP700 Comfort operator panel also without hardware via the TIA Portal. 	

7 Operating the Application Example

7.1 Overview

The following picture shows the menu navigation via the toolbar.
It can be selected from any screen.

Figure 7-1



The user interface consists of 6 pictures:
For the menu items from set 6:

- Filling process (start screen)
- Recipe with teach function
- "Data Log" process data logging
- Quick start for configuring the weighing module and calibrating the scale
- Time setting for synchronization between CPU and HMI
- Call of the Internet Explorer in Windows CE
  (not possible for the simulation via WinCC V14)

in addition, this application example has been added a figure for monitoring the RFID functionality:

- Via 

you get to the RFID menu. Here you can look at the transponder information read and to be written.

7.2 Commissioning

To commission this application example, proceed exactly as in the procedure in set 6 (\16\):

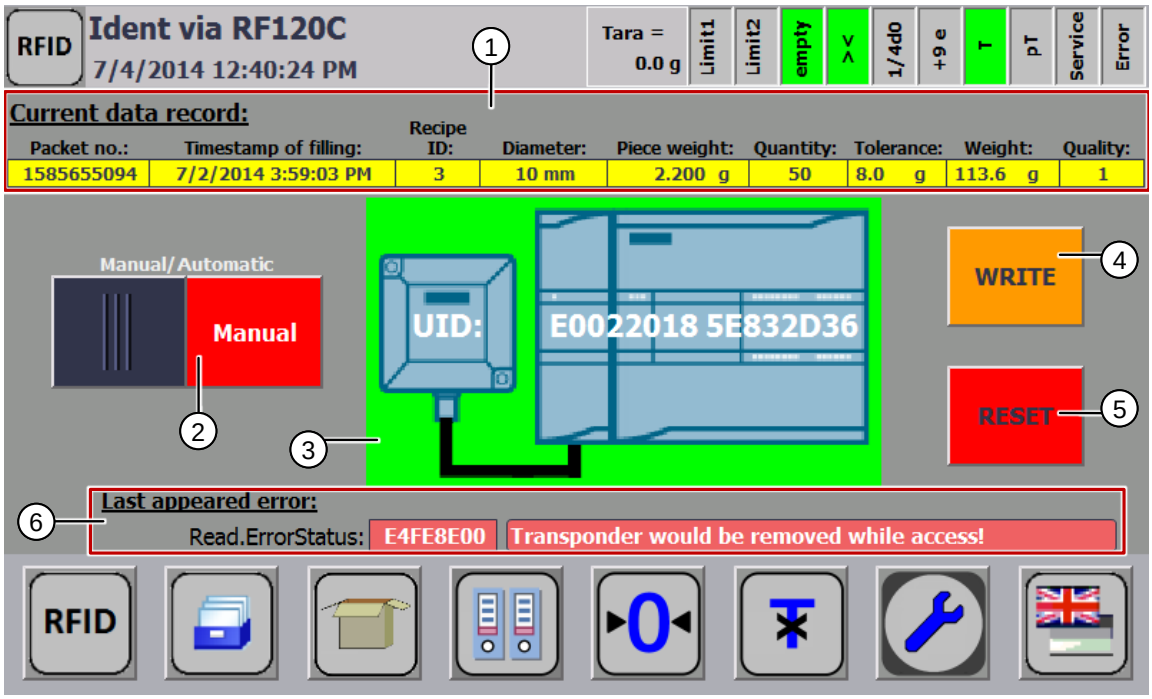
- Set the system time of the CPU.
- Configure the SIWAREX WP231 weighing module with the “quick start” menu option and do the calibration.

7.3 Live demo

7.3.1 RFID

This chapter describes the operation and visualization of the RFID expansion.

Figure 7-2



1. The current data record of the transponder user data is displayed:
   - Packet number
   - System time stamp
   - Recipe number
   - Wall anchor diameter
   - Individual weight of a wall anchor
   - Pieces
   - Tolerance
   - Filling weight

- Quality assessment

Depending on the mode, the background color is displayed as follows:

- **Current data record:**

Packet no.:	Timestamp of filling:	Recipe ID:	Diameter:	Piece weight:	Quantity:	Tolerance:	Weight:	Quality:
1585655094	7/2/2014 3:59:03 PM	3	10 mm	2.200 g	50	8.0 g	113.6 g	1

  blue: user data read by transponder (cannot be edited)

- **Current data record:**

Packet no.:	Timestamp of filling:	Recipe ID:	Diameter:	Piece weight:	Quantity:	Tolerance:	Weight:	Quality:
1585655094	7/2/2014 3:59:03 PM	3	10 mm	2.200 g	50	8.0 g	113.6 g	1

  orange: user data to be written onto the transponder in automatic mode (cannot be edited)

- **Current data record:**

Packet no.:	Timestamp of filling:	Recipe ID:	Diameter:	Piece weight:	Quantity:	Tolerance:	Weight:	Quality:
1585655094	7/2/2014 3:59:03 PM	3	10 mm	2.200 g	50	8.0 g	113.6 g	1

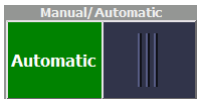
  yellow: user data to be written onto the transponder in manual mode (can be edited via the touch functionality of the input/output fields)

Note

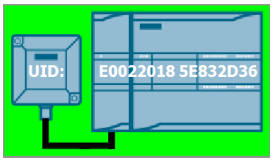
When reading out an empty transponder, the content of the data buffer is (array of byte) 16#00 This cannot be transformed to the time stamp format DTL and output on the operator panel:

Current data record:

Packet no.:	Timestamp of filling:	Recipe ID:	Diameter:	Piece weight:	Quantity:	Tolerance:	Weight:	Quality:
0	##################	0	0 mm	0.000 g	0	0.0 g	0.0 g	0

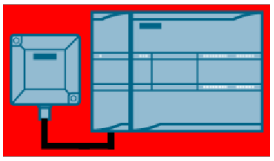
2. Via the 

switch you decide
   - whether you want to edit the transponder user data yourself and trigger the write process manually via the “Write” button (function for test purposes)
   - or whether the transponder user data is generated automatically from set 6 after the successful filling process and written onto the transponder.
3. The indicator field changes the background color:
   - Green: Presence of a transponder in the detection range of the RFID reader (with display of the read out UID in hexadecimal format)



   - Orange: Feedback of successful description of the transponder with user data (with display of the previously read out UID in hexadecimal format)
     Signaling is for one second.

   - Red: Feedback of the successful reset of the RFID reader
     Signaling is for one second.



4. With the help of the 

button you write on the transponder in manual mode with the editable user data from the field (1).
The “Write” button is only visible in manual mode (2) when a transponder is detected.

5. Reset the RFID reader using the 

button.
The “Reset” button can always be executed.

6. In the event of possibly occurring errors during the processing of the following function blocks
   - “Reset_Reader” FB
   - "Read” FB
   - "Write” FB

the affected block, the hexadecimal error code with error message is displayed.

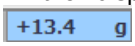
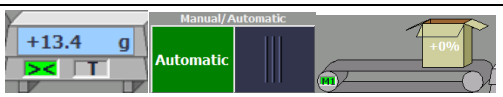
Note Further information in the event of errors can be found in the function manual "SIMATIC Ident RFID systems Ident profile and Ident blocks, standard function for Ident systems" (\6\).

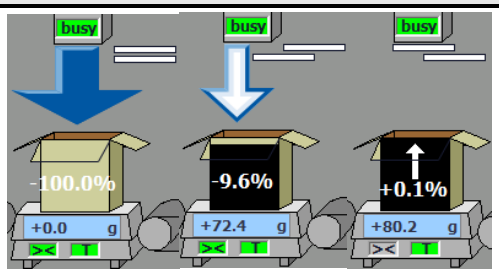
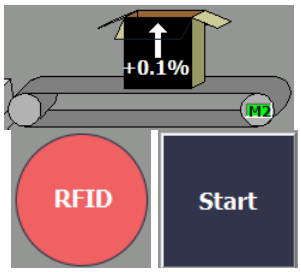
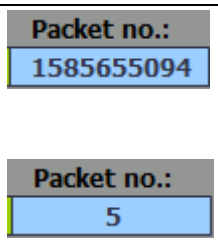
7.3.2 Transponder access error in automatic mode

To be able to write on the transponder, it has to be in the detection range of the RFID reader.
If the transponder is not detected, the filling process (removal of the produced goods) must not be interrupted.

In the following scenario, this case is introduced.

Table 7-1

No.	Action	Remark
1.	Go to the “filling process” screen.	
2.	Place a container with transponder (or without error simulation) on the load cell.	The scale will then display the weight of the container: 
3.	Select a recipe:	
4.	Click the start button.	
5.	This clears the taring, the “Automatic” RFID mode is selected and the “M1” conveyor belt moves the packet (6) onto the scale.	

No.	Action	Remark
6.	Fill the container with the selected wall anchor type.	
7.	• After finishing the filling process, it is waited for the detection of the transponder for one second before the packet is removed. • If the detection is not successful, this is signaled by the flashing RFID icon. The error message is acknowledged by starting the next filling process.	
8.	Go to the “Data Log” process data logging screen.	
9.	• When the transponder is detected, the low-order DWord of the UID as packet number is written in the DataLog file. • After the lapse of the monitoring time, the count value of the filling is written as packet number in the DataLog file and the incorrect transponder access is signaled.	

8 Links & Literature

Table 8-1

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to the entry page of the application example https://support.industry.siemens.com/cs/ww/en/view/96784939
\3\	S7-1200 Automation System - System Manual https://support.industry.siemens.com/cs/ww/en/view/109741593
\4\	MOBY D System Manual https://support.industry.siemens.com/cs/ww/en/view/13628689
\5\	SIMATIC RF Configuration Guide https://support.industry.siemens.com/cs/ww/en/view/67384964
\6\	Function manual “SIMATIC Ident RFID systems Ident profile and Ident blocks, standard function for Ident systems” https://support.industry.siemens.com/cs/ww/en/view/109746389
\7\	SIMATIC Ident RFID systems SIMATIC RF200 System Manual https://support.industry.siemens.com/cs/ww/en/view/47189592
\8\	SIMATIC Ident RFID systems Communications module RF120C manual https://support.industry.siemens.com/cs/ww/en/view/77485950
\9\	Delivery Release for SIMATIC STEP 7 Professional / Basic V14 https://support.industry.siemens.com/cs/ww/en/view/109740340
\10\	Delivery release SIMATIC WinCC V14 https://support.industry.siemens.com/cs/ww/en/view/109739719
\11\	Updates for STEP 7 V14 and WinCC V14 https://support.industry.siemens.com/cs/ww/en/view/109742377
\12\	Where do you find the latest operating system updates (firmware) for SIMATIC S7-1200 controllers? https://support.industry.siemens.com/cs/ww/en/view/77430184
\13\	System Manual STEP 7 Basic V14.0 https://support.industry.siemens.com/cs/ww/en/view/109742266
\14\	Manual WinCC Advanced V14.0 https://support.industry.siemens.com/cs/ww/en/view/109742297
\15\	SIMATIC HMI Devices Comfort Panels https://support.industry.siemens.com/cs/ww/en/view/49313233
\16\	Quality Assurance by means of Weighing, Control and Logging with the SIMATIC S7-1200 (Set 6) https://support.industry.siemens.com/cs/ww/en/view/82454336
\17\	Firmware SIWAREX WP231 https://support.industry.siemens.com/cs/ww/en/view/75231231

9 History

Table 9-1

Version	Date	Modification
V1.1	09/2014	First version
V2.0	10/2017	Update to TIA Portal V14 • Exchange of ident instructions • Copying to the user data via “Serialize” and “Deserialize”