Instruction Manual

IQT1-…-IO-V1 Easy Mode on Beckhoff TwinCAT 3 Control system

IO-Link RFID-head IQT1-…-IO-V1

Project Name:	**IO-Link RFID-head ISO15693 13,56MHz**
Date:	**17.09.2018**
Creator:	**Karsten Reinhardt**

Version overview

Version	Release data	Comment
A	**17.09.2018**	Initial Version

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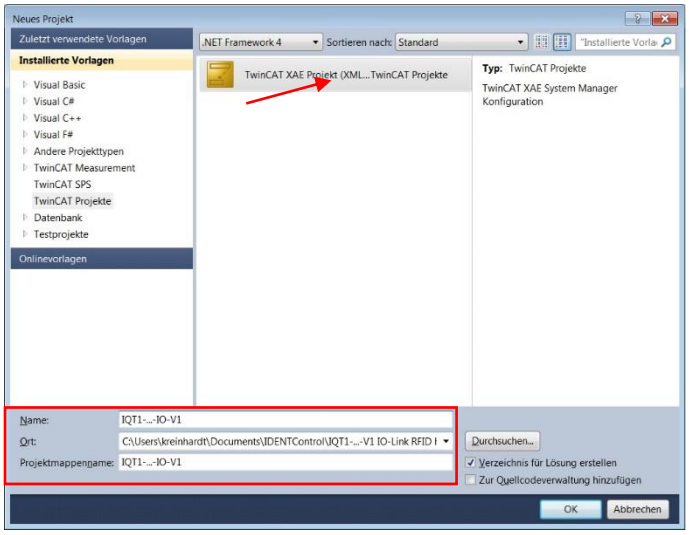
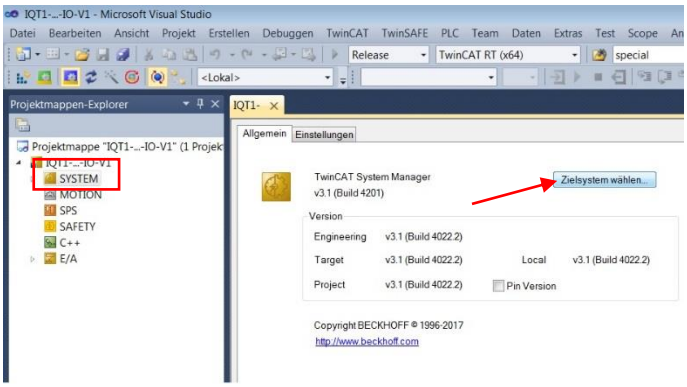
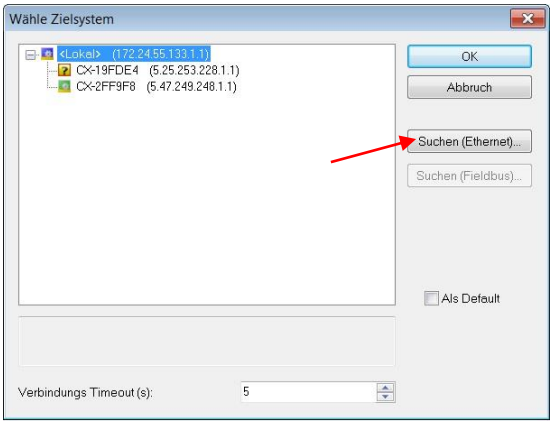
1. Basic control setup

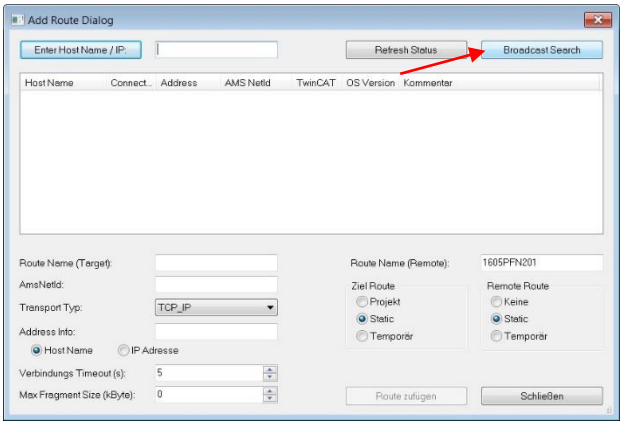


In the first step, a new TwinCAT project must be created. For this purpose a project name (e.g. "IQT1-...-IO-V1") and a storage path of the project must be specified or selected.

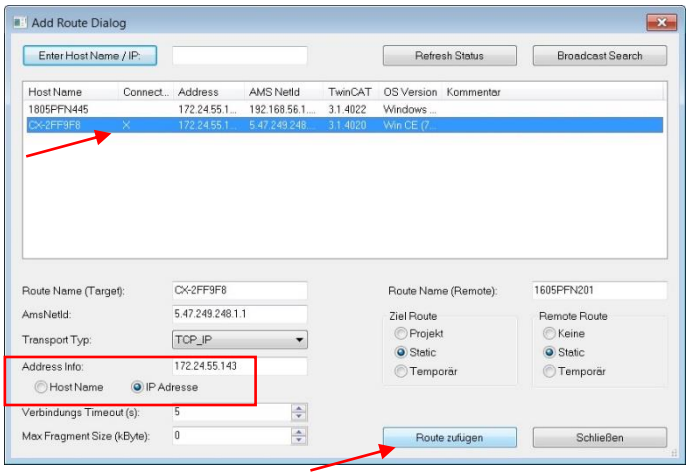


A target system must then be searched for and assigned. To do this, click on "Choose Target" under "System".



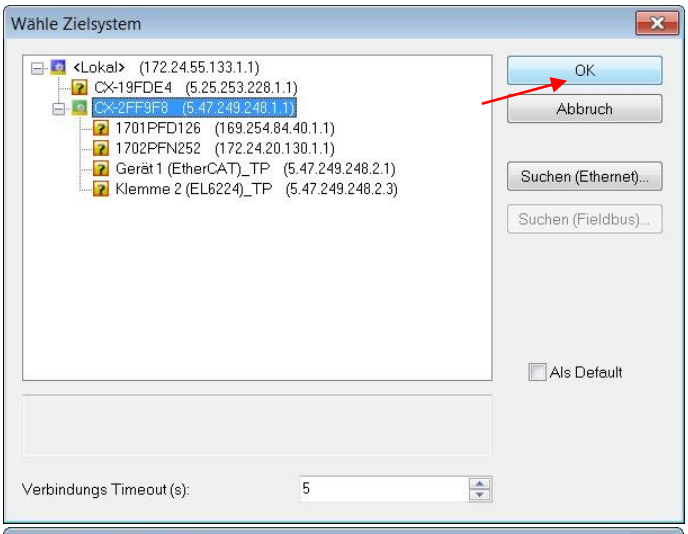


A click on "Search (Ethernet)" opens a new window "Add Route Dialog". Press "Broadcast Search".

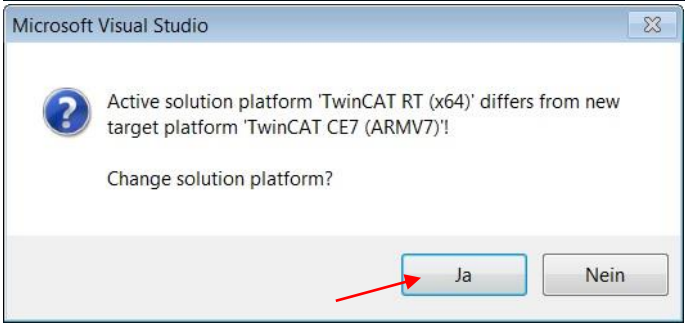


The corresponding controller must be selected. “X" indicates that a connection to this controller already exists. In the "Address Info" area, change to the "IP address" selection. The setting is accepted with "Add Route".

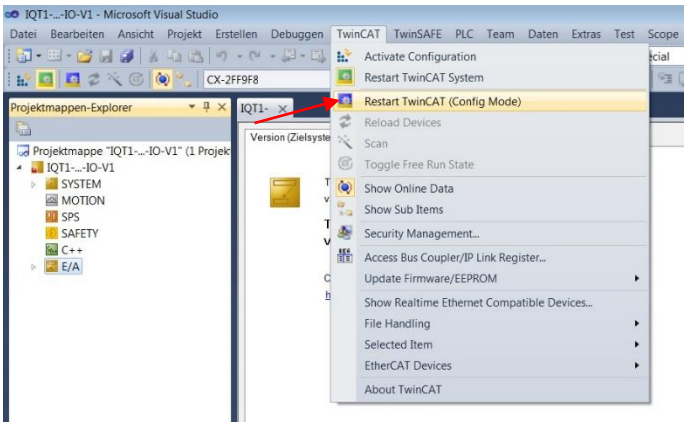
The user name is "Administrator" and the password is "1". This information may vary.



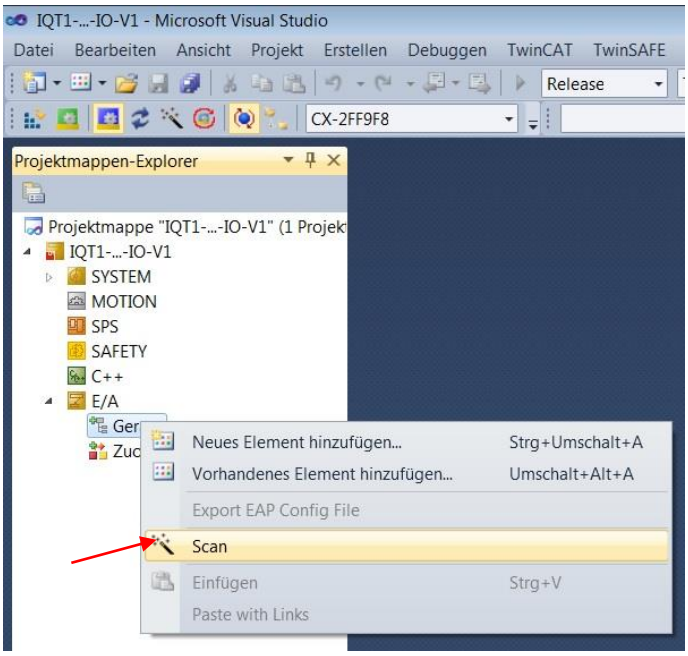
With "OK" the assigned controller is taken over into the project.



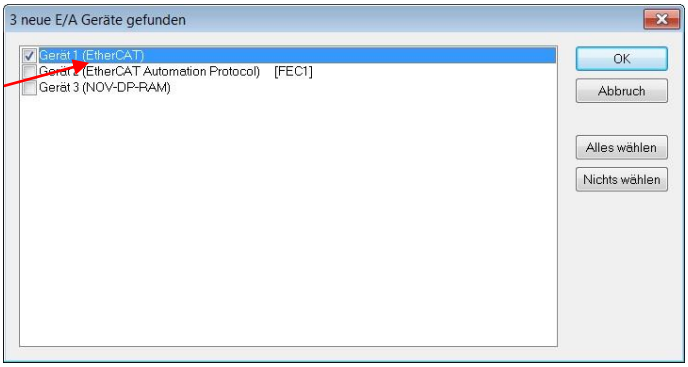
It may be necessary to change the target platform. In this example, "TwinCAT CE7 (ARM7)" is used.



In the next step, TwinCAT must be started in "Config Mode". Click on "TwinCAT" "Restart Twin-CAT (Config Mode)".

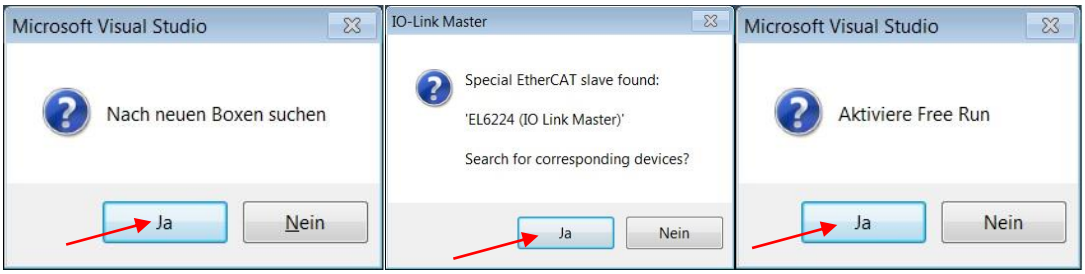


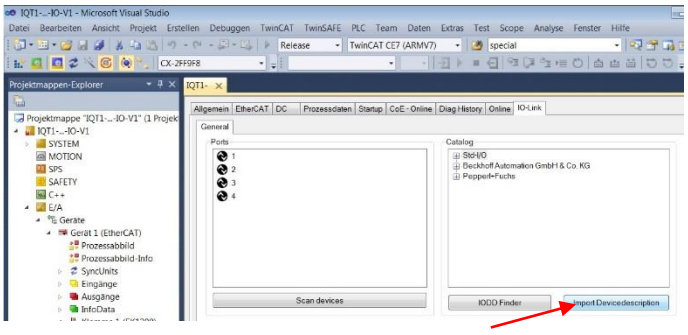
Afterwards a "Scan" for connected devices must be carried out. This implements the master "EL6224" into the project.



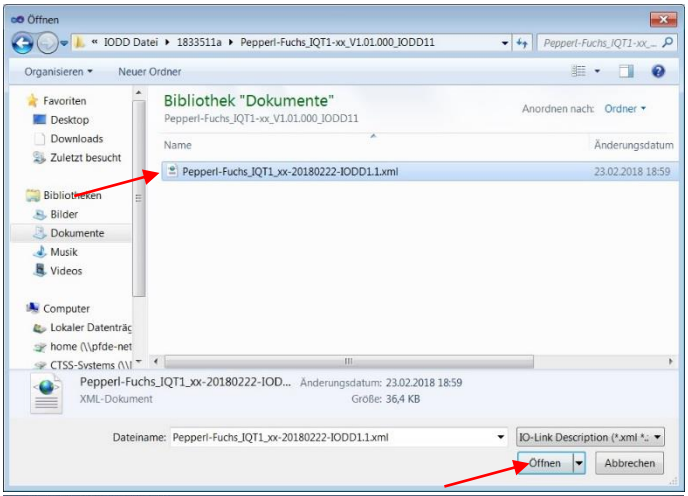
A list of the found devices appears. Select "Device 1 (EtherCAT)". The setting is accepted with "OK".

Then search for new boxes. The found IO-Link Master "EL6224" has to be accepted by selecting "Yes". Then activate the "Free Run" mode.

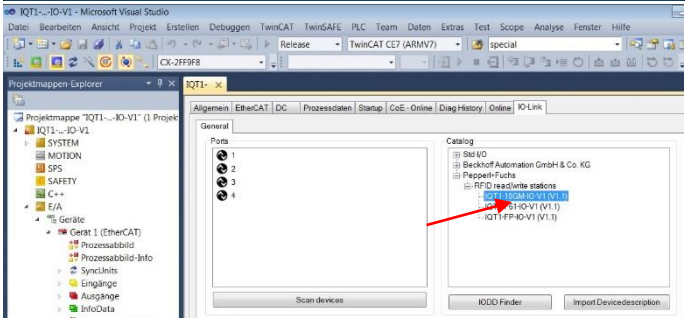




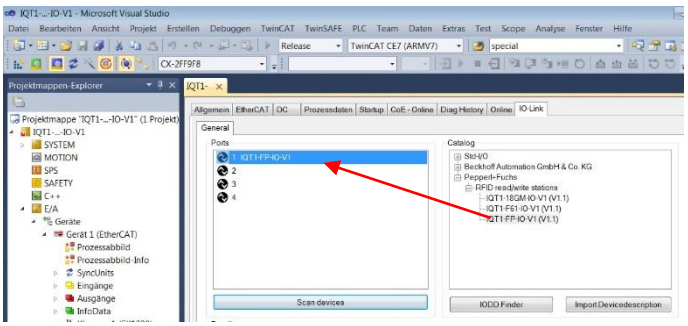
During initial commissioning, the IODD file must first be imported into the catalog. Click on "Import Device description" to select the storage path of the IODD file.



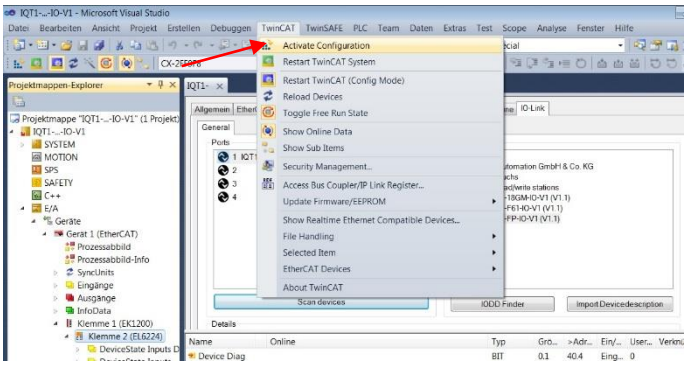
Select the required IODD file for the IQT1-...-IO-V1 RFID head.



The submodules appear in the catalogue on the right. These differed based on the housing design.

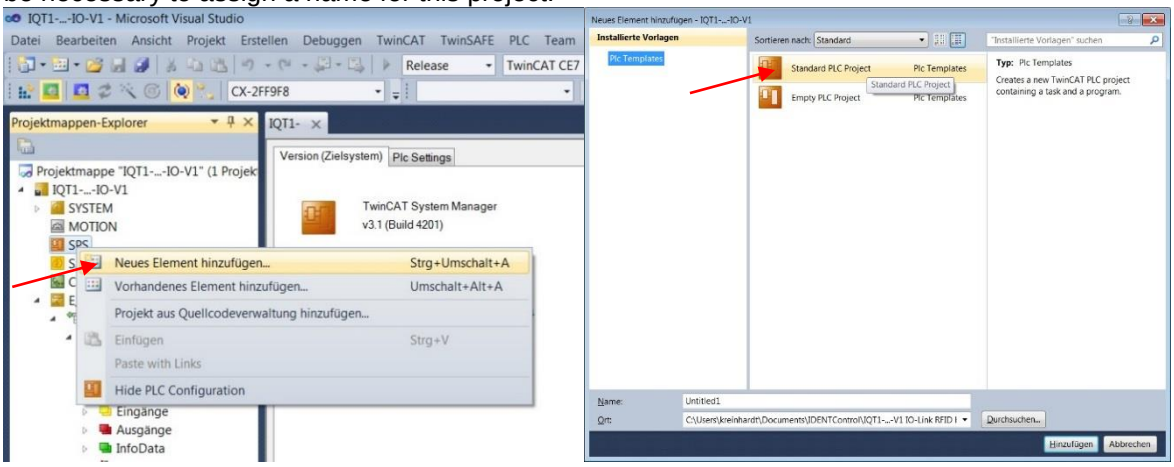


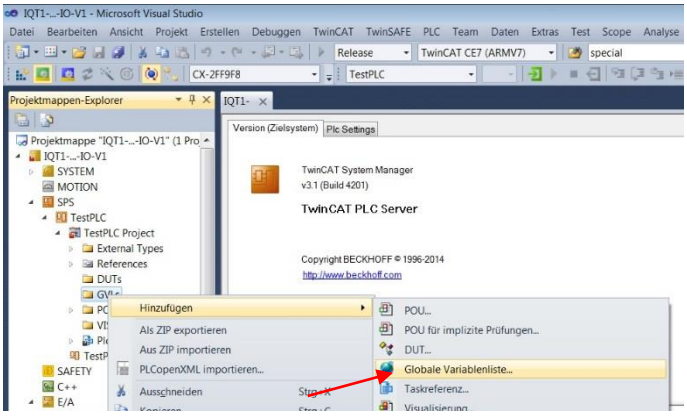
The required submodule from the catalog must be connected to the corresponding placeholder for the port of the IO-Link master. To do this, pull the submodule out of the catalog.



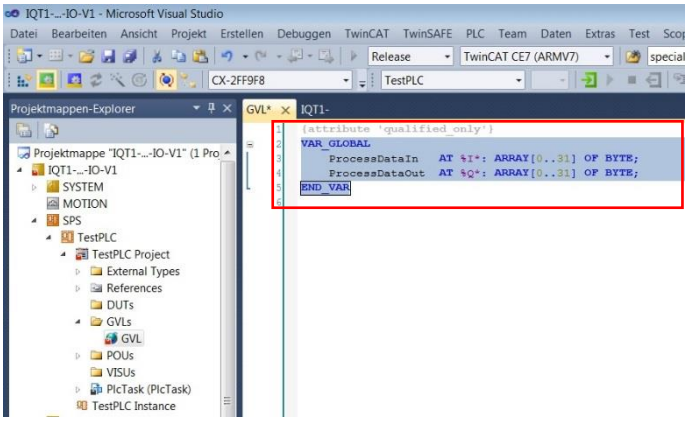
The new configuration must then be activated. The old configuration is overwritten and TwinCAT is then started in Run mode.

A new element must then be added to "PLC". A "Standard PLC Project" must be added here. It may be necessary to assign a name for this project.



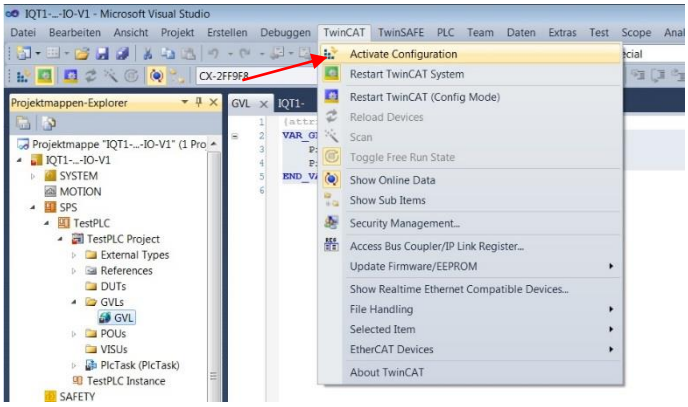


Within the folder, "GVL" a new global variable list has to be added. A name can be assigned to the list.



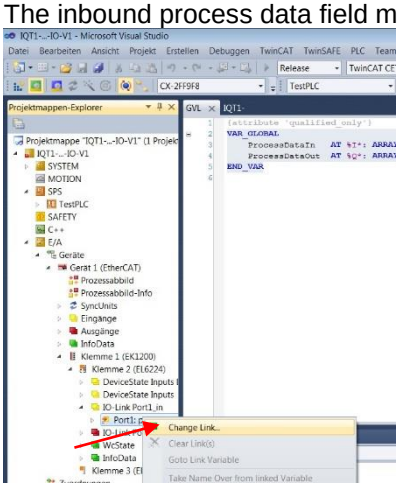
The array fields for the input and output data must be defined in the global variable list.

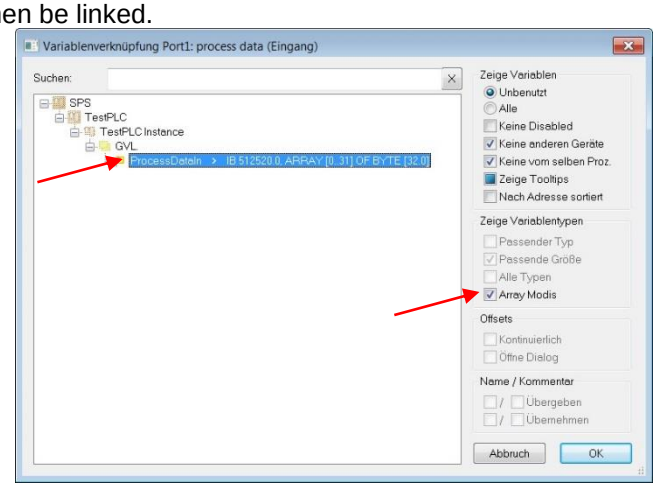
```
VAR_GLOBAL
   ProcessDataIn   AT %I*: ARRAY[0..31] OF BYTE;
   ProcessDataOut  AT %Q*: ARRAY[0..31] OF BYTE;
END_VAR
```



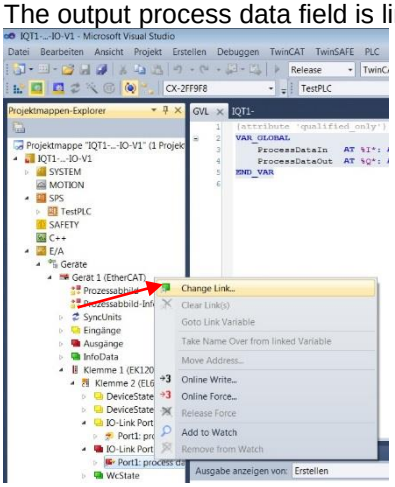
Then activate the configuration by selecting TwinCAT → Activate Configuration.

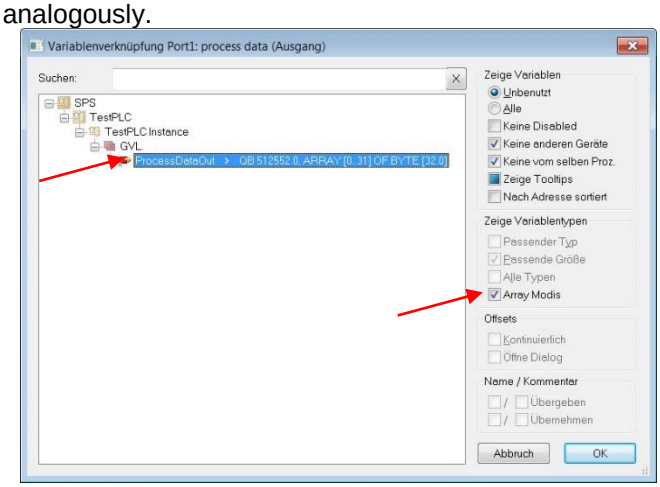
The inbound process data field must then be linked.





The output process data field is linked analogously.





2. Easy-Mode – General information

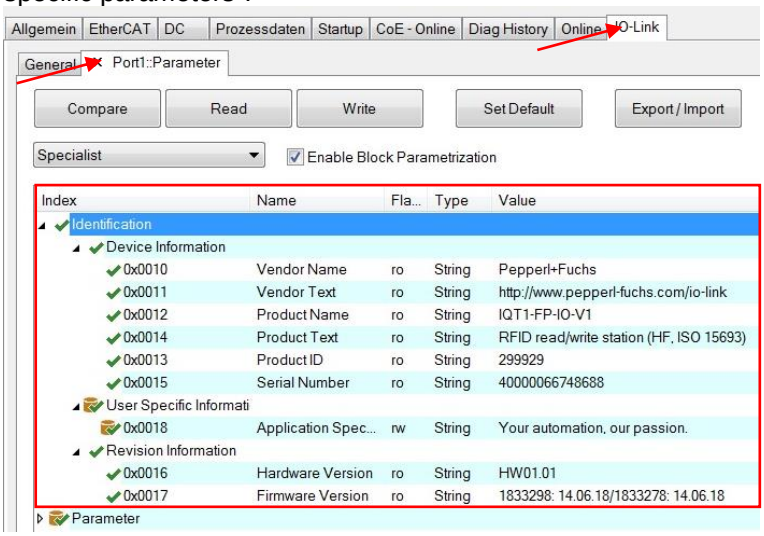
The IQT1-...-IO-V1 RFID head communicates via an "Easy Mode" when the device is delivered. With the "Easy-Mode", a limited amount of data can be read or written from a data carrier without a handshake procedure. The RFID head can be connected to the controller without using an additional function block. This simplifies the effort for device integration and data processing. For simple applications with limited performance requirements, the use of the "Easy-Mode" is therefore recommended.

Within the "Easy-Mode", an "Autostart" function is activated at the factory status. This function automatically starts read access to the user data of the data carrier by the RFID head as soon as the head is supplied with power. In this case, no control values need to be sent to the device, only data is received in the controller.

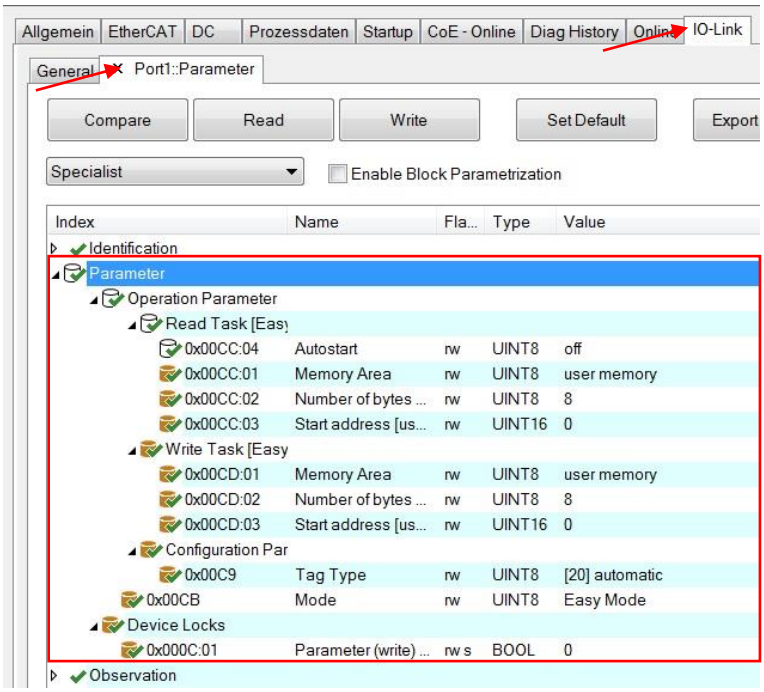
The setting of the IQT1-...-IO-V1 RFID head must be carried out via the configuration of IO-Link device parameters. In the delivery state of the head, the parameters are preset with their initial values, but they can be changed depending on the application.

3. Easy-Mode – IO-Link Parameter IQT1-…-IO-V1

The IO-Link parameters for the IQT1-...-IO-V1 RFID head differ in "general parameters" and "device-specific parameters".



"General parameters" are parameters that are available for each IO-Link capable device. This is, for example, the manufacturer name, the article name or the serial number of the product. These parameters can be displayed via the "Identification" menu.



The "device-specific parameters" are parameters that are only valid for this special IO-Link device. These parameters determine the functionality of the IQT1-...-IO-V1 RFID head. These parameters are displayed via the "Parameters" menu.

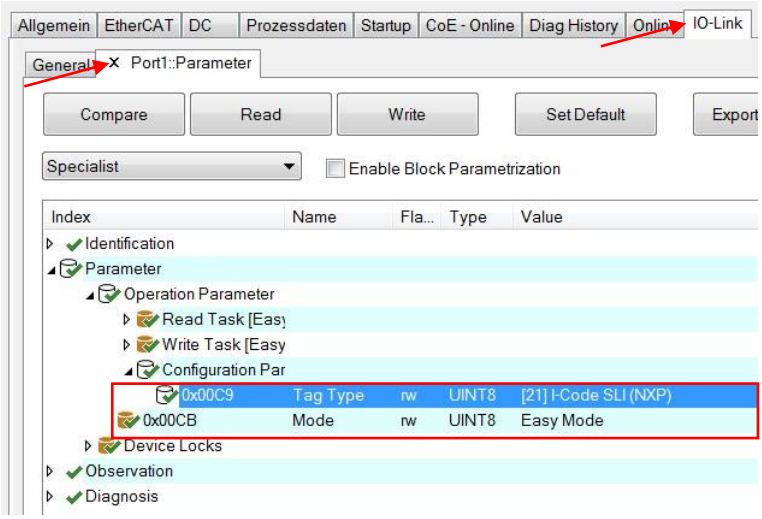
Only the device-specific IO-Link parameters are listed below, since only these influence the functionality of the Easy mode.

4. Easy-Mode – IO-Link Parameter 201 (0x00C9) „TagType“

The "TagType" parameter is used to set the chip type of the data carrier used. The RFID head IQT1-...-IO-V1 supports various chip types. Chip type "20" is set in the delivery state. Thus the fixcode of all ISO15693 compatible data carriers can be read out. The following table shows the supported data carrier types.

Name	Tag Type	Value (HEX)	Access	Fixcode	Data	Block size	Chip	Frequency
	20	0x14	Read Fixcode	8 Byte	-	-	Each ISO15693	13,56MHz
IQC21	21	0x15	Read Fixcode Read / Write Data	8 Byte	112 Byte	4	I-Code SLI(X)	13,56MHz
IQC22	22	0x16	Read Fixcode Read / Write Data	8 Byte	256 Byte	4	Tag-It HF-I Plus	13,56MHz
IQC23	23	0x17	Read Fixcode Read / Write Data	8 Byte	224 Byte	4	My-d SRF55V02P	13,56MHz
IQC24	24	0x18	Read Fixcode Read / Write Data	8 Byte	928 Byte	4	My-d SRF55V10P	13,56MHz
IQC27	27	0x1B	Read Fixcode Read / Write Data	8 Byte	288 Byte	4	EM4135	13,56MHz
IQC31	31	0x1F	Read Fixcode Read / Write Data	8 Byte	32 Byte	4	Tag-It HF-I Stand-ard	13,56MHz
IQC32	32	0x20	Read Fixcode Read / Write Data	8 Byte	32 Byte	4	Tag-It HF-I Pro	13,56MHz
IQC33	33	0x21	Read Fixcode Read / Write Data	8 Byte	2000 Byte	8	MB89R118	13,56MHz
IQC34	34	0x22	Read Fixcode Read / Write Data	8 Byte	232 Byte	4	MB89R119	13,56MHz
IQC35	35	0x23	Read Fixcode Read / Write Data	8 Byte	256 Byte	4	I-Code SLI-S	13,56MHz
IQC36	36	0x24	Read Fixcode Read / Write Data	8 Byte	32 Byte	4	I-Code SLI-L	13,56MHz

The parameter "TagType" has the index value 201 (0x00C9). The supported tag types are specified by a list.

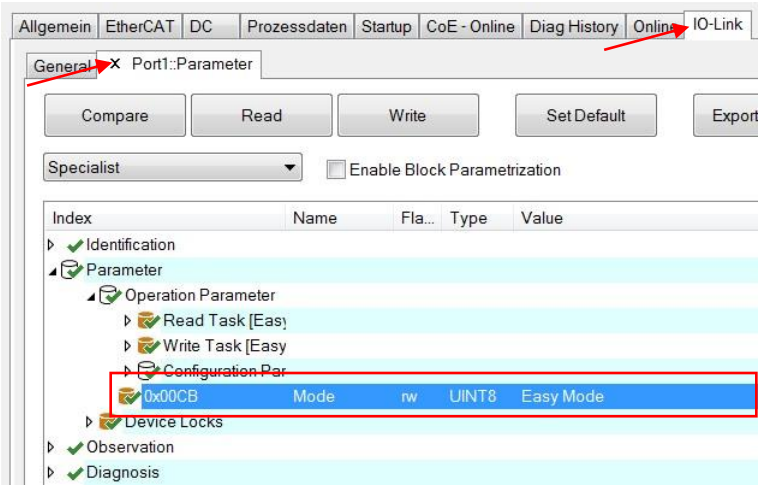


Change of the IO-Link parameter "TagType" to the data carrier type "21". This corresponds to the chip "I-Code SLI" of the manufacturer NXP.

5. Easy-Mode – IO-Link Parameter 203 (0x00CB) „Mode“

The "Mode" parameter can be used to switch between Easy- and Expert-Mode. The “Easy-Mode” is preset at the factory status and allows simplified data access to the data carrier. This means that no additional function block is required for data transmission.
The "Expert-Mode" allows access to large amounts of data using a handshake procedure. This requires the use of a function block to transfer the data.

The parameter "Mode" has the index value 203 (0x00CB). It can be switched between the values "Easy-Mode" and "Expert-Mode".



IO-Link parameter "Mode" is set to the selection "Easy-Mode". This is the factory setting.

Index	Sub index	length	value (HEX)	Access	Significance
203	0	1 Byte	0x80	Read / Write	Easy mode active; factory setting; allows simplified data access to 28 bytes of user data or fixed code
203	0	1 Byte	0x00	Read / Write	Expert mode active; setting for transferring large amounts of data using handshake methods; use of a function block required

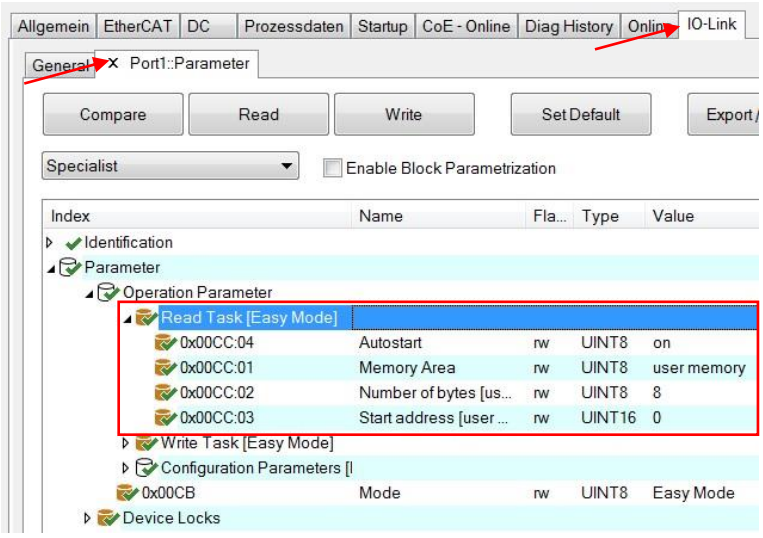
6. Easy-Mode – IO-Link Parameter 204 (0x00CC) „Read Task“

The parameter "Read Task [Easy Mode]" is used to configure the read access to the data carrier. This includes the setting whether the fixcode or the user data are read out. In addition, the number of bytes to be read and the start address are defined. Furthermore it is possible to activate an autostart function. Thus a permanent read command is executed automatically without additional control.

The following table shows the structure of the parameter "Read Task".

Index	Sub index	length	value(HEX)	Access	Significance
204	1	1 Byte	0x00 (user memory)	Read / Write	Access read execution to user data (user memory; customer specific data)
204	1	1 Byte	0x80 (read-only code (UID))	Read / Write	Access reading execution to Fixcode
204	2	1 Byte	0x00 … 0x1C	Read / Write	Number of bytes of user data to be read in; value must be a multiple of 4; when using the IQC33 data carrier, a multiple of 8 must be set
204	3	2 Byte	0x0000 …. 0xFFFF	Read / Write	Start address on data carrier when accessing user data (user data); value must be a multiple of 4; when using the IQC33 data carrier a multiple of 8 must be set
204	4	1 Byte	0x80 (on)	Read / Write	Autostart function active; the Autostart function can be used to activate a permanent reading execution; additional control is then no longer required
204	4	1 Byte	0x00 (off)	Read / Write	Autostart function deactivated; read or write must be started by triggering the "Read" or "Write" bit in the output data field

The parameter "Read Task [Easy-Mode]" has the index value 204 (0x00CC).



IO-Link parameter "Read Task [Easy-Mode] in factory setting.
Autostart := on
Memory Area := user memory
Number of Bytes := 8
Start address := 0

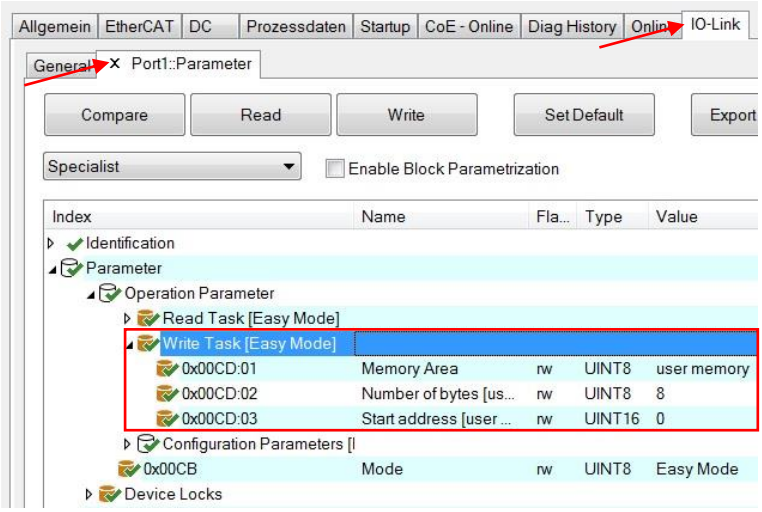
7. Easy-Mode – IO-Link Parameter 205 (0x00CD) „Write Task“

The parameter "Write Task [Easy-Mode]" is used to configure write access to the data carrier. Only the user data can be accessed by writing. In addition, the number of bytes to be written and the start address are set. The configuration of the autostart function is not possible for the write job. The write job is activated via the "Write" bit in the process output data field.

The following table shows the structure of the parameter "Write task".

Index	Sub index	length	Value (HEX)	Access	Significance
205	1	1 Byte	0x00	Read / Write	Access Write request to user data (user memory; customer specific data)
205	2	1 Byte	0x00 … 0x1C	Read / Write	Number of bytes of user data to be added; value must be a multiple of 4; when using the IQC33 data carrier, a multiple of 8 must be set
205	3	2 Byte	0x0000 …. 0xFFFF	Read / Write	Start address on data carrier when accessing user data (user memory; customer-specific data); value must be a multiple of 4; when using the IQC33 data carrier a multiple of 8 must be set

The parameter "Write request" has the index value 205 (0x00CD).



IO-Link Parameter „Write Task [Easy-Mode] in factory setting.
Memory Area := user memory
Number of Bytes := 8
Start address := 0

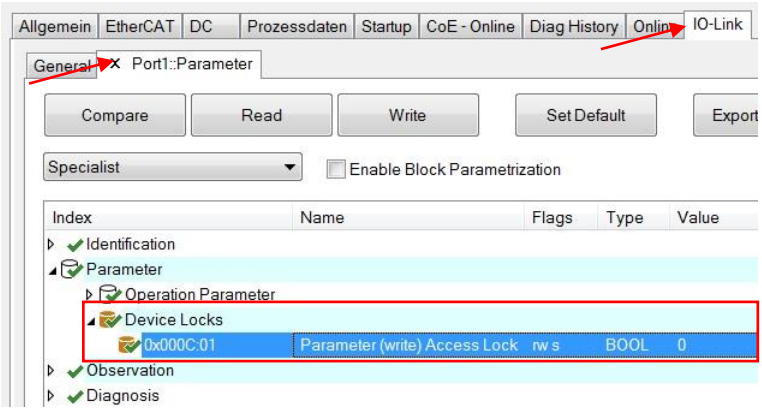
8. Easy-Mode – IO-Link Parameter 12 (0x000C) „Device Access Locks“

The parameter "Device Access Locks" offers the possibility to activate write protection for the device parameters. This means that the IO-Link device parameters can no longer be changed. In addition, the data storage of the device can be switched off.

The following table shows the structure of the "Device Access Locks" parameter.

Index	Sub index	length	value (HEX)	Access	Significance
12	0	2 Byte	0x0000	Read / Write	Not locked, parameters can be changed
12	0	2 Byte	0x0001	Read / Write	Lock for changing parameters
12	0	2 Byte	0x0002	Read / Write	Data storage lock
12	0	2 Byte	0x0003	Read / Write	Lock for changing parameters and data storage

The parameter "Device Access Locks" has the index value 12 (0x000C).



IO-Link parameter "Device Access Lock" in the factory setting. A lock for parameter access is not activated. The parameters can be changed.

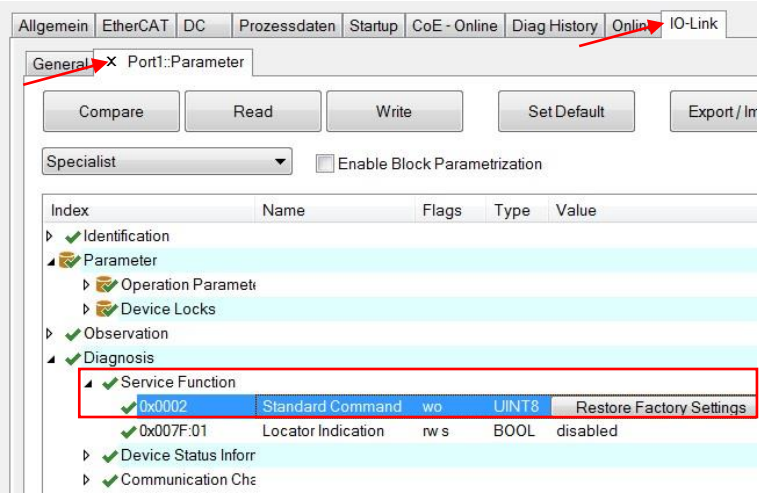
9. Easy-Mode – IO-Link Parameter 2 (0x0002) „System Command“

The parameter "System Command" offers the possibility to reset the IO-Link parameters to the factory settings. Please note that access to the IO-Link parameters is enabled (Device Access Locks not activated). The factory setting is only active after a manual power interruption.

The following table shows the structure of the "System Command" parameter.

Index	Sub index	length	value (HEX)	Access	Significance
2	0	1 Byte	0x82	Write	Reset to factory setting

The parameter "System Command" has the index value 2 (0x0002).



IO-Link "System Command" parameter for resetting to the factory setting.

10. Easy-Mode – Process data structure

The process data is transferred between the IQT1-...-IO-V1 RFID head and the controller via the process data fields. There is a process data field for input data, i.e. from the direction of the head to the controller, and a process data field for output data, i.e. from the direction of the controller to the RFID head. Both process data fields have a fixed length of 32 bytes. This length is constant and always amounts to 32 bytes. A deviating length parameterization is not possible.
The following table shows the structure of the process data field for the output data:

Byte	content							
0	0	0	0	0	0	0	Start Write	Start Read
1	unused							
2	unused							
3	unused							
4	Write Data							
5	Write Data							
6	Write Data							
….	Write Data							
31	Write Data							

If the "Autostart" function is activated, no output data must be sent. The head performs a permanent read access to user data (factory setting, 8 byte length) or Fixcode. When using the "Autostart" function, the bits "Start Read" and "Start Write" have no relevance.

The "Autostart" function can be switched off via parameter 204 "Read task". If the function is switched off, a read task or a write task can be started via the "Start Read" or "Start Write" bit.

A read task or a write task is executed as long as the corresponding start bit is set. The task can only be aborted by resetting the corresponding start bit.

The parameters required for data carrier access such as "memory area", "number of bytes" and "start address" can be set for the read task via parameter 204 and for the write task via parameter 205.

The following table shows the structure of the process data field for the input data:

Byte	content							
0	0	0	0	0	Error	Active	Write valid	Read valid
1	Length data							
2	Unused							
3	Unused							
4	Read Data							
5	Read Data							
6	Read Data							
…	Read Data							
31	Read Data							

As soon as a read or write task is started and executed, this is indicated by the "Active" bit. This bit remains set for the complete period of the task execution. Only when the read or write task is aborted does the "Active" bit reset itself.
If a read job is active, the "Read valid" bit is set if the data carrier is within the detection zone and the data has been read. The bit remains set for the duration of the data carrier's stay in the detection zone. This bit is only reset again when the data carrier leaves the detection zone.

The bit "Write valid" behaves identically. It is set if the data carrier is in the detection zone and the data was successfully written to the data carrier. The reset takes place as soon as the data carrier leaves the detection zone again.

The byte "Length data" contains the length of the read data in bytes. The length depends on the number of bytes set via parameter 204. When accessing the Fixcode, the length is 8 bytes and when accessing the user data, the length is a multiple of 4 bytes (or 8 bytes when using an IQC33 transponder).

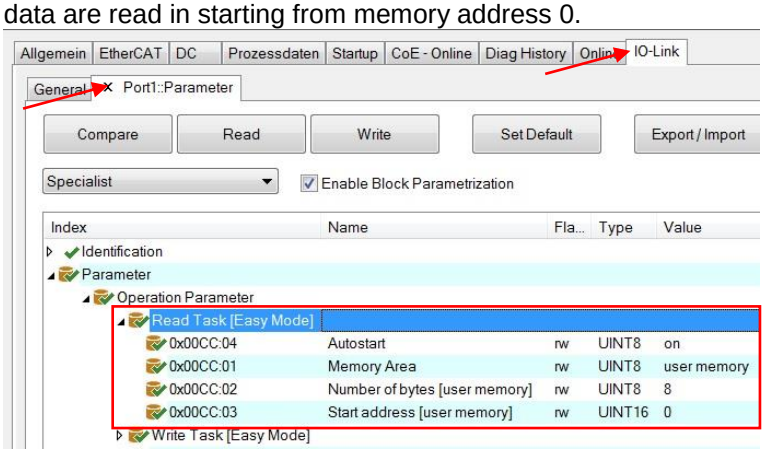
An error may occur during the execution of a read or write task. The error state is indicated by the "Error" bit. If there is an error state, additional error information is transmitted via the process input data field. This information contains an error code as well as an error description in plain text (ASCII character). A check of the error description provides an indication of the cause of the error condition.

The following table shows the structure of the process data field of the input data in error state:

Byte	content							
0	0	0	0	0	Error	Active	Write valid	Read valid
1	Length data							
2	Unused							
3	Unused							
4	Error Code (HEX)							
5	Error String							
6	Error String							
…	Error String							
31	Error String							

11. Example: Reading user data with Autostart function

In the factory state of the IQT1-...-IO-V1, the Autostart function is activated and 8 bytes of the user data are read in starting from memory address 0.

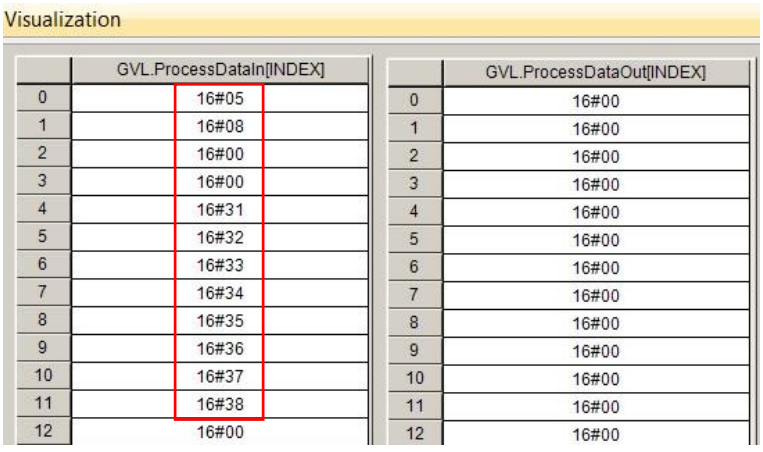


Factory setting Parameter 204 (0x00CC) „Read Task [Easy Mode]
Autostart := ON
Memory Area := User Memory
Number of Bytes := 8
Start address := 0

The process input data field (Input Data) has the following structure:

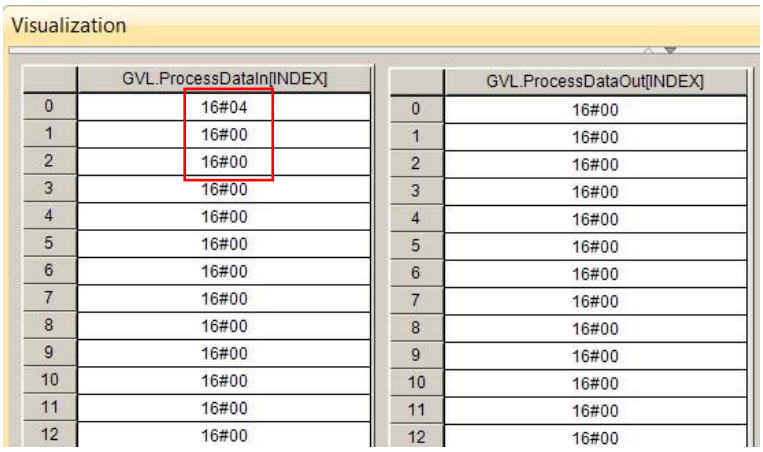
Byte	content							
0	0	0	0	0	Error	Active	Write valid	Read valid
1	Length data							
2	Unused							
3	Unused							
4	Read Data							
5	Read Data							
6	Read Data							
7	Read Data							

Within byte 0, the bits "Active" and "Read valid" are both set to "1". This signals that a read task is active ("Active") and that a data carrier is within the detection range ("Read valid"). This results in a value of 0x05 for byte 0.
Byte 1 transmits the length of the read data if the data carrier is in the detection zone. A number of 8 bytes to be read in from address 0 was previously defined by the IO-Link parameter 204 ("Read task"). The transmission of the length takes place together with the transmission of the user data.
Bytes 2 and 3 are not used in the reply of the Easy mode and therefore have the value 0x00.
The read-in user data are located within bytes 4 to 11. In the example the values are 0x31, 0x32, 0x33, 0x34, 0x35, 0x36, 0x37 and 0x38.



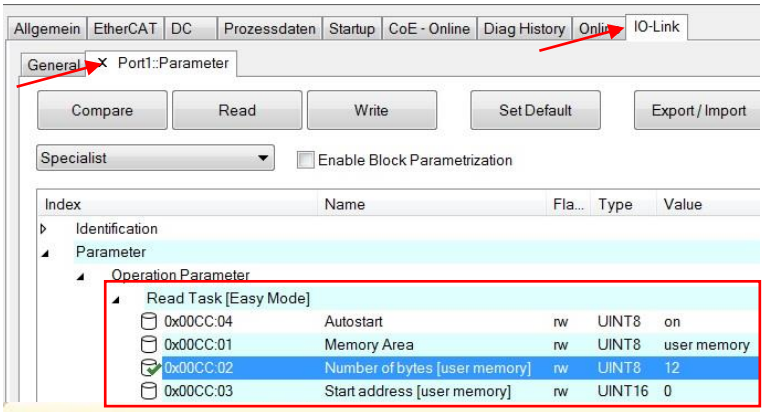
Process input data field if a data carrier is within the detection zone.
Read valid := True
Write valid := False
Active := True
Length data := 8 (0x08)
Data from Byte 4 to 11

If the data carrier moves out of the detection zone, the "Read valid" bit is reset to 0. The "Active" bit remains set. The following figure shows the input data field if there is no data carrier in the detection zone.

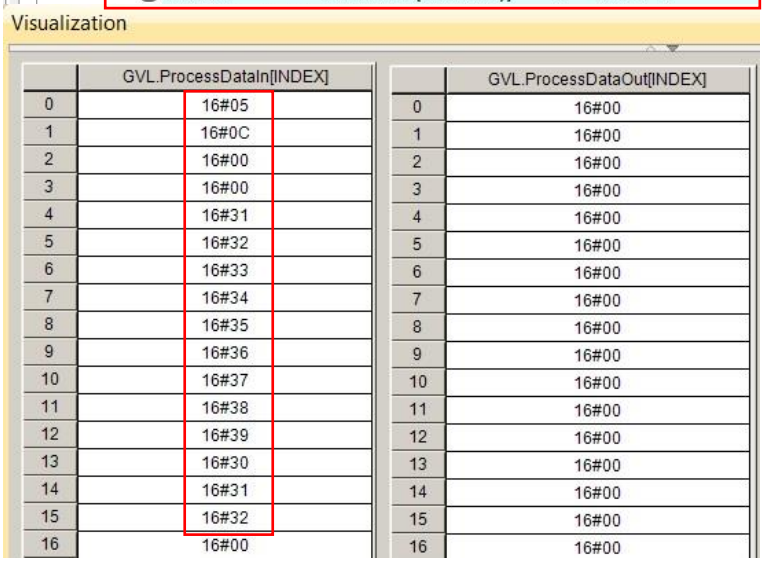


Process input data field if no data carrier is within the detection zone
Read valid := False
Write valid := False
Active := True
Length data := 0
Data → all 0x00

The number of user data to be read in can be increased by the IO-Link parameter 204 (0x00CC) "Read Task ".

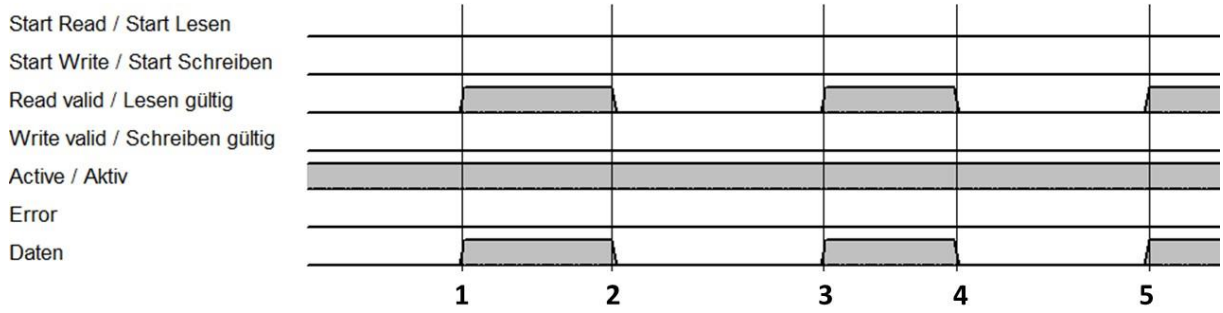


Change parameter "Number of Bytes" to 12. 12 bytes of user data are thus accessed from address 0.



Process input data field if a data carrier is within the detection zone. 12 user data bytes from address 0 are read in.
Read valid := True
Write valid := False
Active := True
Data length := 12 (0x0C)
Data → from Byte 4 to 15

The following figure shows the flow chart for the execution of a read task using the Autostart function.

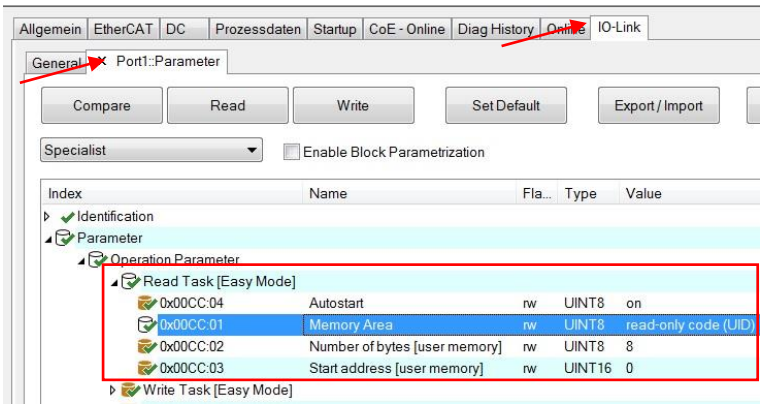


When a read task is executed by the Autostart function, the read task is automatically started by the RFID head. The execution of the read task is indicated by the bit "Active".

Event	Meaning
1	Data carrier A enters the detection zone of the RFID head and the data are read in; the "Read valid" bit signals that the read-in data are available in the process input data field; for the time period of the data carrier's presence in the detection zone, the "Read valid" bit remains set and the data in the process input data field remains valid
2	Data carrier A leaves the detection zone of the RFID head; the "Read valid" bit is reset, as there is no data carrier within the detection zone; the area with the previously read data is overwritten with 0x00.
3	Data carrier B enters the detection zone of the RFID head and the data are read in; the "Read valid" bit signals that the read-in data are available in the process input data field; for the time period of the data carrier's presence in the detection zone, the "Read valid" bit remains set and the data in the process input data field remains valid
4	Data carrier B leaves the detection zone of the RFID head; the "Read valid" bit is reset as there is no data carrier within the detection area; the area with the previously read data is overwritten with 0x00.
5	Analogous to events 1 and 3

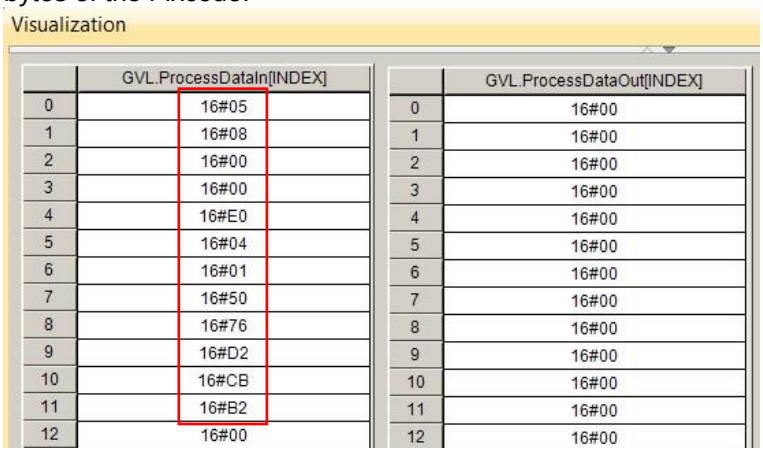
12. Example: Read Fixcode with Autostart function

In addition to the user data (user memory; customer-specific data), it is also possible to read the Fixcode of the data carrier. The fixcode is an 8 byte long unique number for every ISO15693 compliant 13.56MHz data carrier. To read out the Fixcode, the access to the Fixcode must be changed within the parameter 204 (0x00CC) "Read Task [Easy Mode]". The autostart function remains switched on.

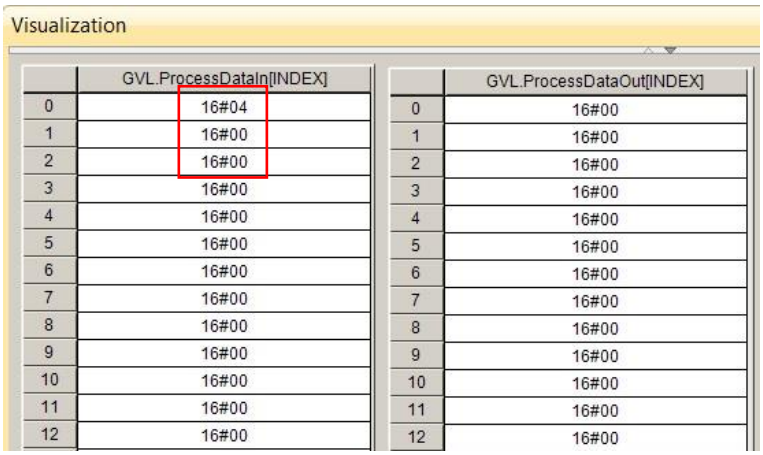


Change parameter "Memory Area" to "read only code (UID)". This accesses the unique 8 byte long Fixcode (UID) of the data carrier.

Within byte 0, the bits "Active" and "Read valid" are both set to "1". This signals that a read task is active ("Active") and that a data carrier is within the detection zone ("Read valid"). This results in a value of 0x05 for byte 0.
Byte 1 transmits the length of the read Fixcode if the data carrier is within the detection zone. The IO-Link parameter 204 ("read task") has previously defined access to the Fixcode. This always has a length of 8 bytes. The transmission of the length takes place together with the transmission of the Fixcode.
Bytes 2 and 3 are not used in the reply of the Easy mode and therefore have the value 0x00.
Within bytes 4 to 11 there is the read in Fixcode. The Fixcode always starts with the value 0xE0. The manufacturer (e.g. NXP, Texas, Infineon) as well as the chip type can be determined by the first 3 bytes of the Fixcode.



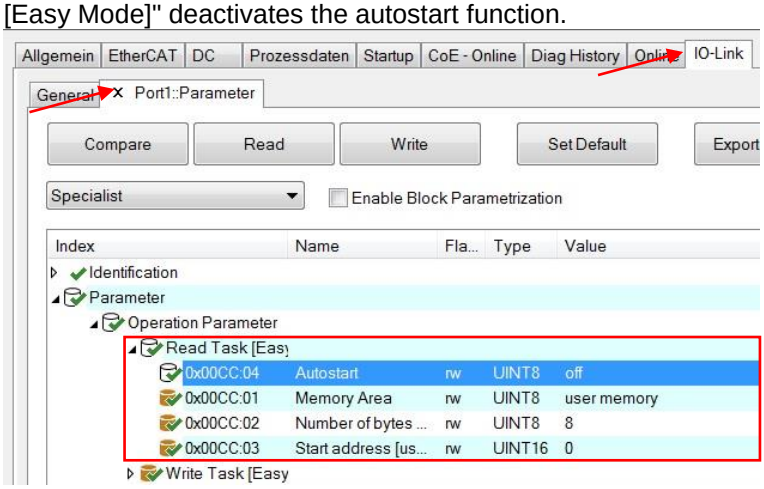
Process input data field if a data carrier is within the detection zone. The Fixcode (UID) with a length of 8 bytes is read.
Read valid := True
Write valid := False
Active := True
Length data := 8 (0x08)
Fixcode → from Byte 4 to 11



Process input data field if no data carrier is within the detection zone
Read valid := False
Write valid := False
Active := True
Length data := 0
Data →all 0x00

13. Example: Read user data without Autostart Function

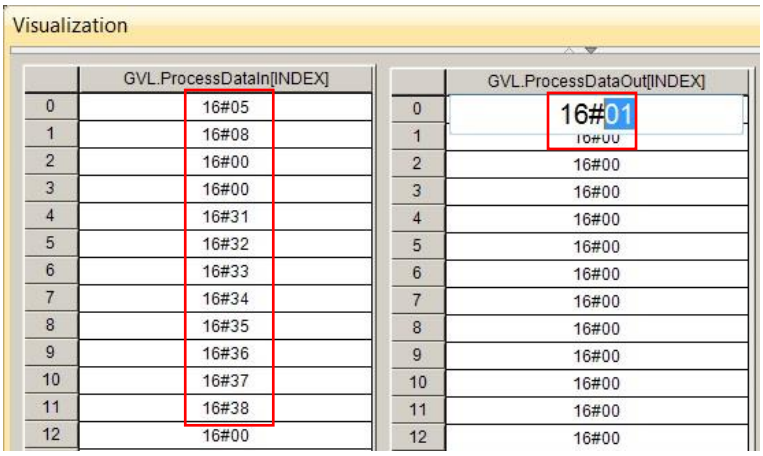
In the delivery state of the IQT1-...-IO-V1 the autostart function is activated and 8 bytes of the user data are read in starting from memory address 0. The IO-Link parameter 204 (0x00CC) "Read Task [Easy Mode]" deactivates the autostart function.



Change parameter "Autostart" to "off" (switched off). This means that no read task is started automatically. The read task must therefore be started via the output process data field.
Autostart := OFF
Memory Area := User Memory
Number of Bytes := 8
Start address := 0

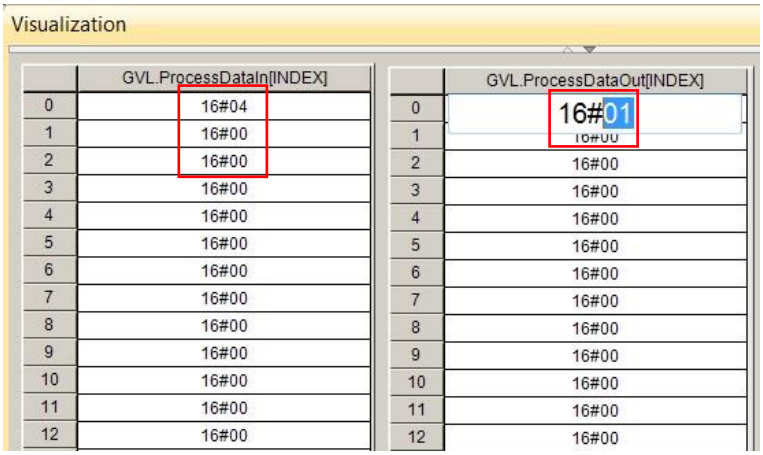
This configuration applies to the user memory with a length of 8 bytes (Number of Bytes) from the start address 0 (Start address). The autostart function is switched off.

To start the read task, the bit "Start Read" in the process output data field of the controller must be set to "1". As soon as the read task is executed, the "Active" bit in the input data field is set to "1". The "Read valid" bit is also set to "1" for the period of time during which the data carrier is present within the detection zone.



Start reading task by changing the "Start Read" bit in the process output data field (right).
Process input data field (left) if a data carrier is within the detection zone. User data with a length of 8 bytes are read.

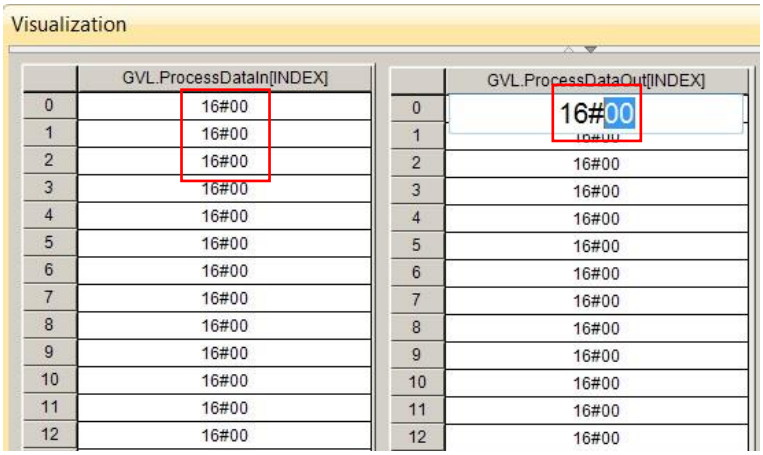
Read valid	:= True
Write valid	:= False
Active	:= True
Length data	:= 8 (0x08)
Data →	from Byte 4 to 11



Start read task by changing the "Start Read" bit in the process output data field (right). Process input data field (left) if there is no data carrier within the detection zone.

Read valid	:= False
Write valid	:= False
Active	:= True
Length data	:= 0
Data →	all 0x00

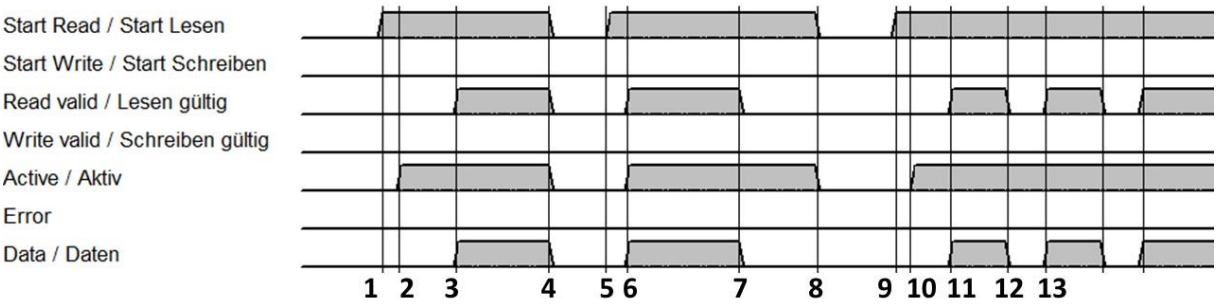
The execution of the read task is terminated when the bit "Start Read" within the process output data field is set back to "0". After completion of the read task, the "Active" bit in the input data field is set to "0" and thus signals that no more task is being executed. The other process data values are set to 0x00.



Read task aborted by changing the "Start Read" bit in the process output data field (right) to 0 (False).
Process input data field (left) if read task was terminated.

Read valid	:= False
Write valid	:= False
Active	:= False
Length data	:= 0
Data →	all 0x00

The following figure shows the flow chart for the execution of a read task without Autostart function.

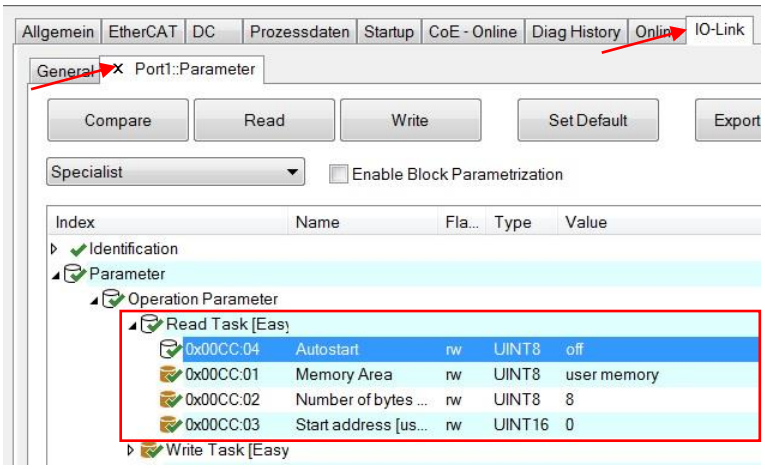


The execution of a read task must be controlled by the "Start Read" bit in the process output data. Automatic control does not take place because the autostart function has been deactivated.

Event	Meaning
1	Start of the execution of a read task by the "Start Read" bit in the process output data; there is currently no data carrier in the detection zone
2	The read request is executed, which is signaled by the bit "Active".
3	A data carrier A enters the detection zone; the "Read valid" bit displays the validity of the imported data in the process input field
4	The read task is stopped by resetting the "Start Read" bit; bits "Read Valid" and "Active" are reset and the read-in data is overwritten with 0x00.
5	Start of the execution of a read task by the "Start Read" bit in the process output data; there is currently a data carrier B in the detection zone.
6	The bit "Active" indicates the execution of the read task; the bit "Read valid" changes to "1", because at the start time of the read task a data carrier was already in the detection zone; the read data are valid.
7	Data carrier B leaves the detection zone which is indicated by a signal change of the bit "Read valid" from "1" to "0"; the read task remains active (bit "Active" = "1"); the data field with the previously read data is overwritten with 0x00.
8	The read task is terminated (bit "Start Read" = "0"); the bit "Active" changes from "1" to "0" to signal the end of the task
9	Start of a read task by changing the signal of the "Start Read" bit from "0" to "1"; there is no data carrier in the detection zone
10	Read task is executed; the bit "Active" is "1".
11	Data carrier C enters the detection zone; the data is read in ("Read valid" = "1") and can be found in the process input data.
12	Data carrier C leaves the detection zone; read task still active ("Active" = "1"); the data field with the previously read data is overwritten with 0x00.
13	Data carrier D enters the detection zone; the data is read in ("Read valid" = "1") and can be found in the process input data.

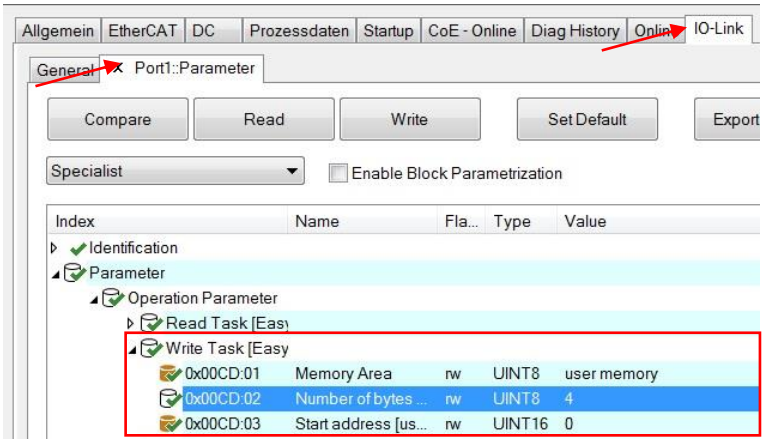
14. Example: Write User data

In the delivery state of the IQT1-...-IO-V1, the Autostart function is activated and 8 bytes of the user data are read in starting from memory address 0. A write operation on a data carrier is not possible when the Autostart function is active. The IO-Link parameter 204 (0x00CC) "Read Task [Easy Mode]" deactivates the autostart function.



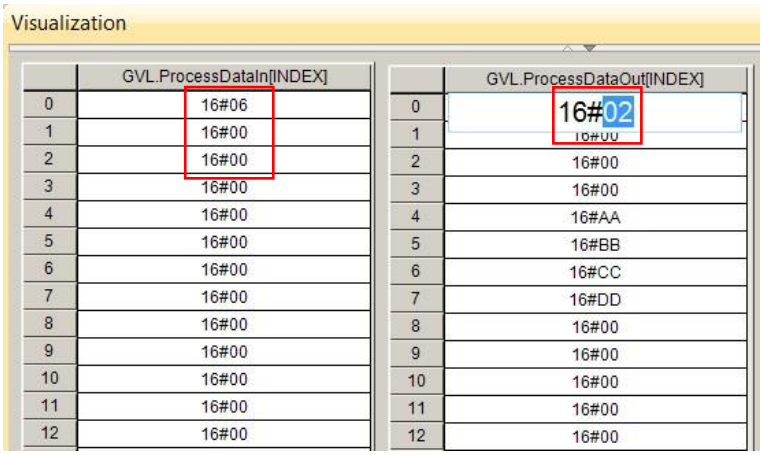
Change parameter "Autostart" to "off" (switched off). This means that no read task is started automatically. A write task can now be started via the process output data field.
Autostart := OFF

The setting of the configuration for writing is carried out via the IO-Link parameter 205 (0x00CD) "Write Task [Easy Mode]". The parameters in the "Write Task" are used to define the memory area to which data is to be written, and the number of bytes with which data is to be written, starting from an address (Start address).



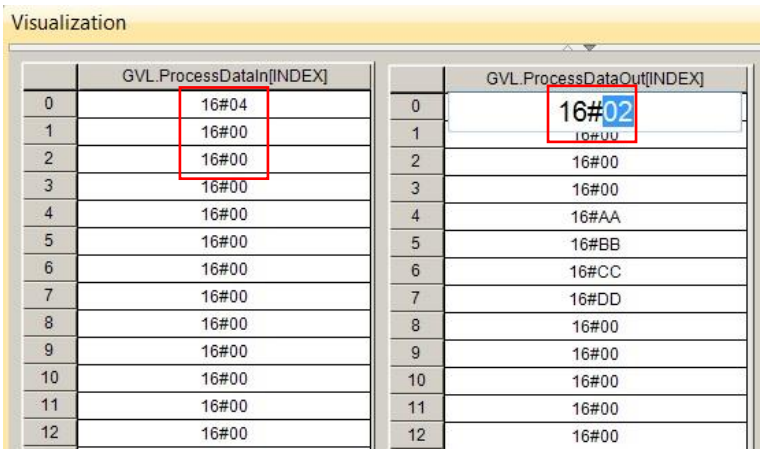
Change parameter "Number of Bytes" to the value 4 (0x04). Thus 4 bytes can be written. The write access to the user data is executed starting at address 0. The write task must be started via the output process data field.
Memory Area := User Memory
Number of Bytes := 4
Start address := 0x0000

To start the write task, the bit "Start Write" in the process output data field of the controller must be set to "1". At the same time, the data to be written must also be transferred to the output data field. As soon as the write task is executed, the bit "Active" is set to "1" in the input data field. The bit "Write valid" is also set to "1" for the period of time during which the data carrier is present within the detection range. As soon as this bit is set to "1", the data is successfully written into the data carrier.



Start write task by changing the "Start write" bit in the process output data field (right). The write data is transferred with a length of 4 bytes starting from byte 4. Process input data field (left) if a data carrier is within the detection zone and the data was written successfully.

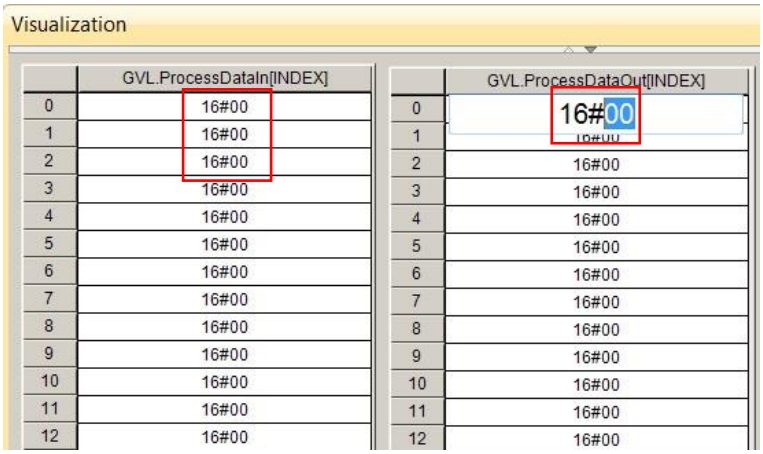
Read valid := False
Write valid := True
Active := True



Start write task by changing the "Start write" bit in the process output data field (right). The write data is transferred with a length of 4 bytes starting from byte 4. Process input data field (left) if no data carrier is within the detection zone and could not be written.

Read valid := False
Write valid := False
Active := True

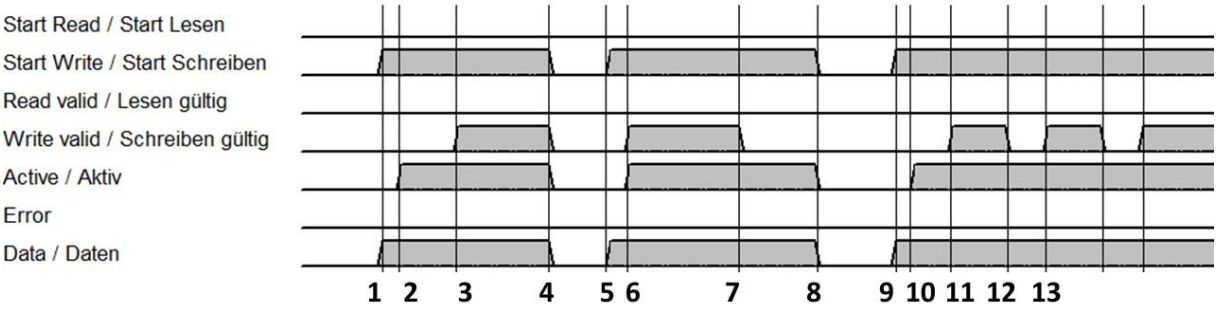
The execution of the write task is terminated when the bit "Start Write" within the process output data field is set back to "0". After completion of the write task, the bit "Active" in the input data field is set to "0" and thus signals that no more task is being executed. The other process data values are set to 0x00.



Cancel write task by changing the "Start Write" bit in the process output data field (right) to 0 (False). The write data must be added to 0x00. Process input data field (left) if write task was finished.

Read valid := False
Write valid := False
Active := False

The following figure shows the flow chart for executing a write task.

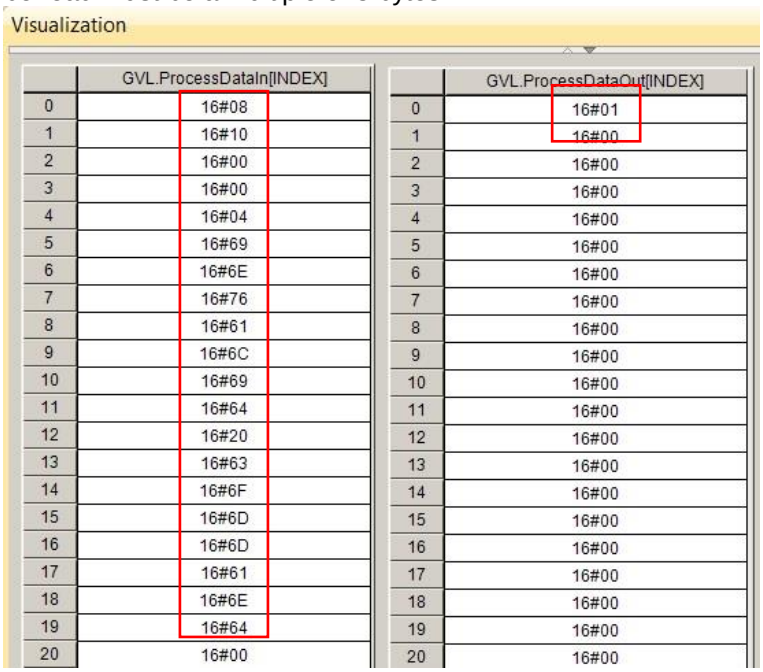


Event	Meaning
1	Start of the execution of a write task by the "Start Write" bit in the process output data; simultaneous transfer of the write data to the process output data field; there is currently no data carrier in the detection zone.
2	The write task is executed, which is indicated by the bit "Active".
3	A data carrier A enters the detection zone; the "Write valid" bit indicates that the data has been successfully written to the data carrier.
4	The write task is stopped by resetting the "Start Write" bit; bits "Write valid" and "Active" are reset and the write data is reset to 0x00.
5	Start of the execution of a write task by the "Start Write" bit in the process output data; there is currently a data carrier B in the detection zone.
6	The bit "Active" indicates the execution of the write task; the bit "Write valid" changes to "1", because at the start time of the write task a data carrier was already in the detection zone; the data have been written successfully.
7	Data carrier B leaves the detection zone which is indicated by a signal change of the bit "Write valid" from "1" to "0"; the write task remains active (bit "Active" = "1");
8	The write task is terminated (bit "Start Write" = "0"); the bit "Active" changes from "1" to "0" to signal the end of the job
9	Start of a write task by changing the signal of bit "Start Write" from "0" to "1"; there is no data carrier in the detection zone
10	Write task is executed; the bit "Active" is "1".
11	Data carrier C enters the detection zone; the data is successfully written to the data carrier ("Write valid" = "1").
12	Data carrier C leaves the detection zone; write task still active ("Active" = "1")
13	Data carrier D enters the detection zone; the data is successfully written to the data carrier ("Write valid" = "1").

15. Example: Error message via process data field

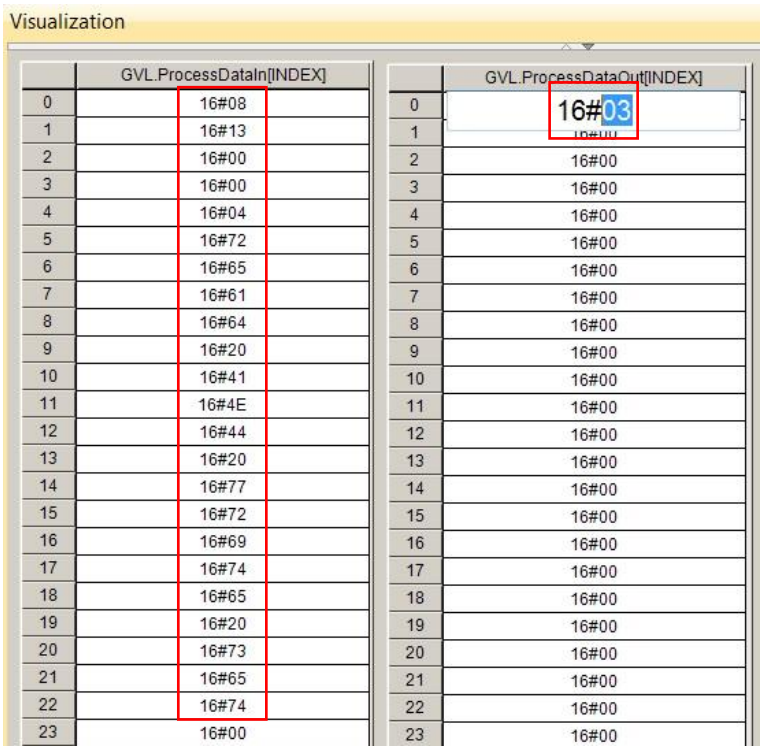
The IQT1-...-IO-V1 RFID head sends an error message to the controller via the process data field when a read or write task is executed. If an error condition occurs, an error code and a short error description are transmitted in plain text (ASCII).

The following figure shows the error message when executing a read task for access to 4 bytes of user data. The error message was generated when a data carrier IQC33 entered the detection zone. This data carrier has a block size of 8 bytes and if these data carriers are used, the number of bytes to be read must be a multiple of 8 bytes.



The error code is 0x04 and thus signals an error in the command parameters. The transmitted error description is "invalid command". This indicates that the command parameter (number of Bytes) does not match the data carrier used (IQC33).

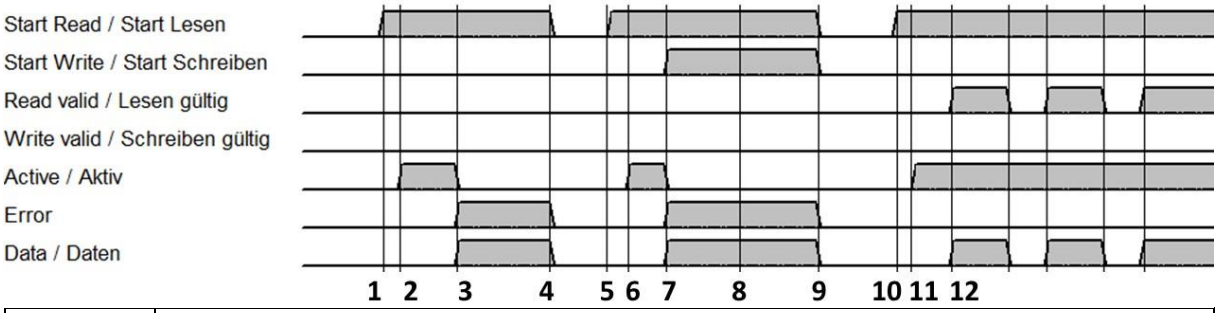
Error := True
Active := False
Write valid := False
Read valid := False
Data length := 0x10 (16 byte long)
Status := 0x04 (Error in the command parameters)
Error message → Byte 5...19



If the user simultaneously starts the read and write task with the bits "Start Read" and "Start Write", an error message is also generated. The error code is also 0x04 and the display text is "read and write". The image on the left shows the error message.

Error := True
Active := False
Write valid := False
Read valid := False
Data length := 0x13 (19 byte long)
Status := 0x04 (Error in the command parameters)
Error message → Byte 5...22

The following figure shows the flowchart when an error message occurs:



Event	Meaning
1	Start of the execution of a read task by the "Start Read" bit in the process output data; there is currently no data carrier in the detection zone.
2	The read task is executed, which is signaled by the bit "Active".
3	A data carrier A enters the detection zone; the bit "Error" is set and an error message is entered within the data area; the cause of the error is, for example, a number of bytes that is not suitable for the data carrier; the bit "Active" is reset.
4	The read task is stopped by resetting the "Start Read" bit; the "Error" bit is reset and the error message is overwritten with 0x00.
5	Start of the execution of a read task by the "Start Read" bit in the process output data; there is currently no data carrier within the detection zone.
6	The bit "Active" indicates the execution of the read task
7	The "Start Write" bit is set; this causes a read and write task to be active at the same time; this is inadmissible and is signaled by the "Error" bit; an error message is entered in the data area.
8	The bits "Start Read" and "Start Write" are still set and the error message remains unchanged.
9	The bits "Start Read" and "Start Write" are reset; the bit "Error" is reset and at the same time, the error message 0x00 is overwritten.
10	Start read task by "Start Read" = 1
11	Read task is active; signalization by "Active" = 1
12	Data carrier enters the detection zone and is read out successfully; „Read valid" is set

16. Troubleshooting

Index	Error description	correction
1	No blue LED on the IQT1-...-IO-V1; only the green LED flashes.	1. the blue LED on the head signals the execution of a read or write task 2. Check whether Autostart function is active. Switch on the Autostart function via IO-Link parameter 204 (0x00CC) "Autostart". 3. Alternatively, it is possible to start the read task via the process output data when the Autostart function is switched off.
2	No orange LED if data carrier is within detection range	1. orange LED indicates successful access to the data carrier 2. Check whether suitable data carrier type is set. Read IO-Link parameter 201 and compare with data carrier list. 3. Check whether the number of bytes matches the block size of the data carrier. IQC33 requires a number of bytes as a multiple of 8 bytes. All other data carriers as multiples of 4
3	No green flashing LED on head	1. green flashing LED on head indicates correct IO-Link connection 2. Check in the hardware configuration of the PLC whether the corresponding port of the IO-Link master is correct.
4	Byte 0 of the input data field contains 0x40	1. This value indicates that Expert mode is activated. In this case, the value of the IO-Link parameter 203 is 0x00 2. Changing the IO-Link parameter 203; this activates the Easy Mode. 3. the more significant nibble in byte 0 always has the value 0 in Easy Mode
5	The IQC33 data carrier cannot be read or written.	1. In the factory setting, the number of bytes is set to 8. This allows access to any data carrier with a block size of 4 and 8 bytes. 2. The IQC33 has a block size of 8 bytes and therefore the number of bytes must be set to a multiple of 8.
6	The IQC37 data carrier cannot be read or written.	1. The IQC37 is only supported when using Expert Mode.
7	No change of the read-in data despite change of the start address	1. The address is counted byte by byte 2. Data change if the address is increased by the block size. 3. For IQC21, IQC22m IQC24 the address is a multiple of 4, for IQC33 the address is a multiple of 8.
8	After setting the tag type for the IQC33, "invalid command" is displayed.	1. The TagType is used to define the data carrier. After conversion to the IQC33, the number of bytes must be a multiple of 8. 2. Conversion of the number of bytes to 8 or multiples thereof
9	An unknown data carrier cannot be read	1. Resetting the settings of the IO-Link head via parameter 2 by assigning (writing) the value 0x82 2. Change the execution of the read request to the Fixcode by changing the IO-Link parameter 204. 3. Check whether Fixcode can be read. If Fixcode is readable, the data carrier can be accessed in principle (possibly change TagType); if access is not possible, the data carrier is not compatible with ISO15693.
10	Reset to factory setting via parameter 2 does not work	1. After the write to the IO-Link parameter 2 has been executed with the value 0x82, the supply voltage of the IQT1-...-IO-V1 must be reset.