Hardware manual

ETCio 100

EtherCAT I/O module

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Manual number: 4.01.0250.20000
Version: 1.0

1. Introduction

The "ETCio 100" EtherCAT IO module permits the simple, quick connection of analog and digital input and output signals to EtherCAT systems – whether in component test benches, mobile applications, or in the area of industrial automation as a universally applicable interface.

In the ETCio 100, you have purchased a high-quality electronic component that has been developed and manufactured according to the latest technological state of the art. The ETCio 100 was developed according to the EtherCAT specification V1.0.2 and the EtherCAT Protocol Enhancements version 1.0.0.

This manual should help you gain familiarity with the ETCio 100. Please read this manual before using the unit for the first time.

1.1 Features

Power supply voltage and power consumption

- Power supply voltage 6-32 V DC
- Current consumption about 80 mA at 12 V

EtherCAT- Interface

- RJ45 plug connector with port-IN and port-OUT

EtherCAT- cycle time

- Minimum cycle time: 150 µs

Plug connectors

- Power supply: 2-pin Phoenix-Contact plug RM 3,5
- I/O signals: 16-pin connection for digital and analog Signals, Phoenix-Contact plug RM 3,81

Inputs and outputs

- 6 digital inputs
- 2 digital outputs, high-side switch, short circuit resistant
- 2 analog inputs, 12-bit, 0 … +10 V
- 2 analog outputs, 12-bit, max. 20 mA

Output voltage ranges programmable via software:

0 … +5 V

0 … +10 V

0 … +10.8 V

CAN interface (optional, not installed in the standard version)

- ISO 11898-2 CAN bus coupling, galvanically decoupled
- CAN-2.0B-Controller, High-Speed CAN-Interface
- CAN isolation working voltage:
  130 V AC/DC (continuous)
  1000 V DC (1 second)
- CAN-Transceiver: Texas Instruments SN65HVD251

LIN interface (optional, not installed in the standard version)

- LIN Transceiver: TJA1020T

User Interface - LEDs

- 1 LED for EtherCAT-status
- 2 LEDs for special functions (user LEDs)
- 1 LED for power supply display

Temperature range and humidity

- Temperature range: -40 °C up to +70 °C
- Humidity: 10-95%, not condensing

Housing and protection class

- Robust aluminum housing, IP40

Dimensions

- 100 x 79 x 31 mm

Weight (with housing)
230 g

1.2 Variants of the unit

The ETCio 100 is available in the following variants:

Order number	Variants of the unit
1.01.0250.20001	ETCio 100 (in aluminum housing)
1.01.0250.21001	ETCio 100 (board-level product)
Upon request	ETCio 100 with CAN-Interface (board-level product)
Upon request	ETCio 100 with LIN-Interface (board-level product), upon request only
Upon request	ETCio 100 with CAN and LIN interface (board-level product), upon request only

Accessories

Order number	Variants of the unit
1.04.0086.00000	Mounting clip for ETCio 100 (for DIN rail tophat rails and wall mounting)

1.3 EtherCAT

"EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany."

2. Plug pinout

2.1 Plug (PWR) power supply, 6-32 VDC

The ETCio 100 is supplied with direct current of 6-32V.

The plug used is of the following type: Phoenix Contact plug part 2-pin MC1,5/2-STF-3,5 - 1847055.

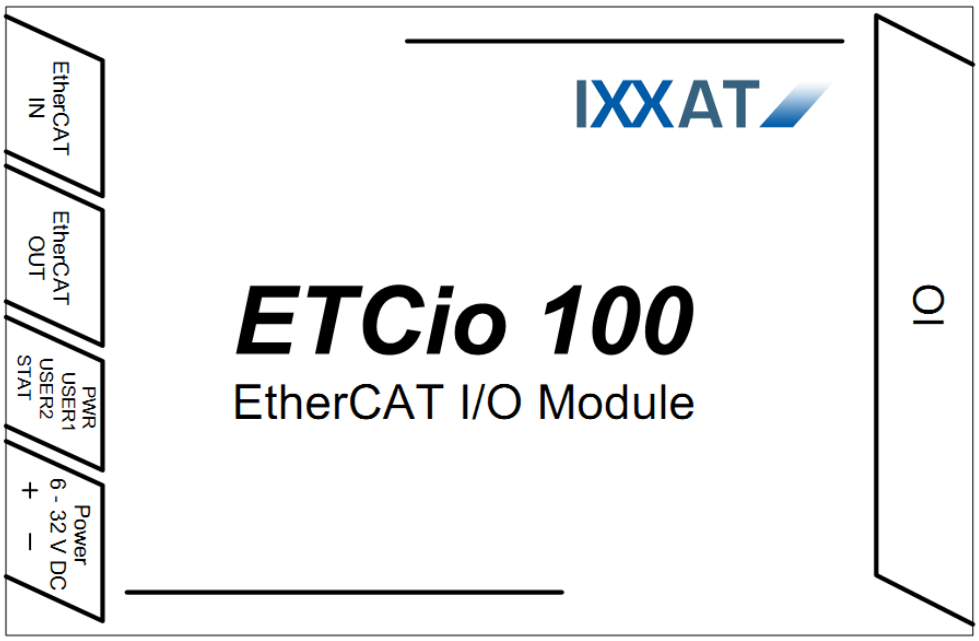


Figure 1: Front side with the position of connections and LEDs

2.2 Inputs and outputs

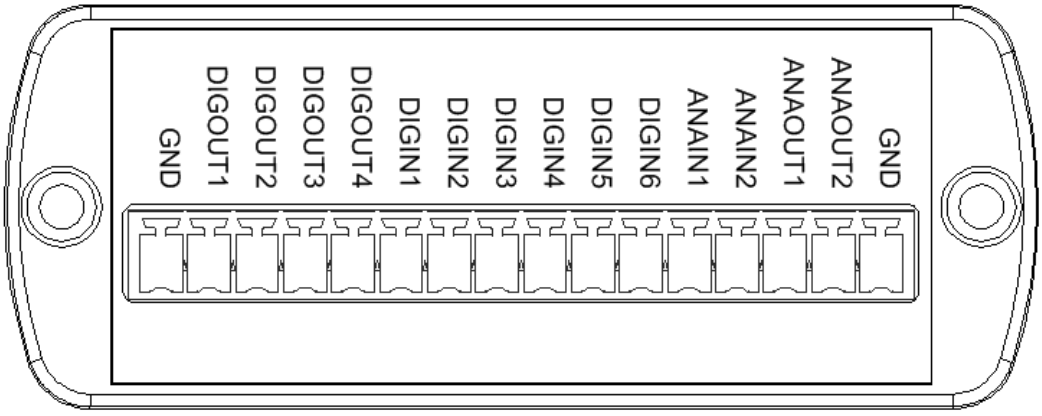
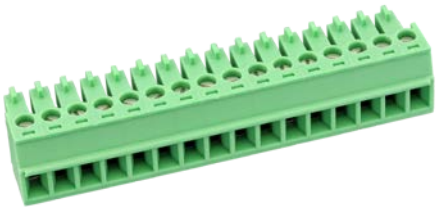


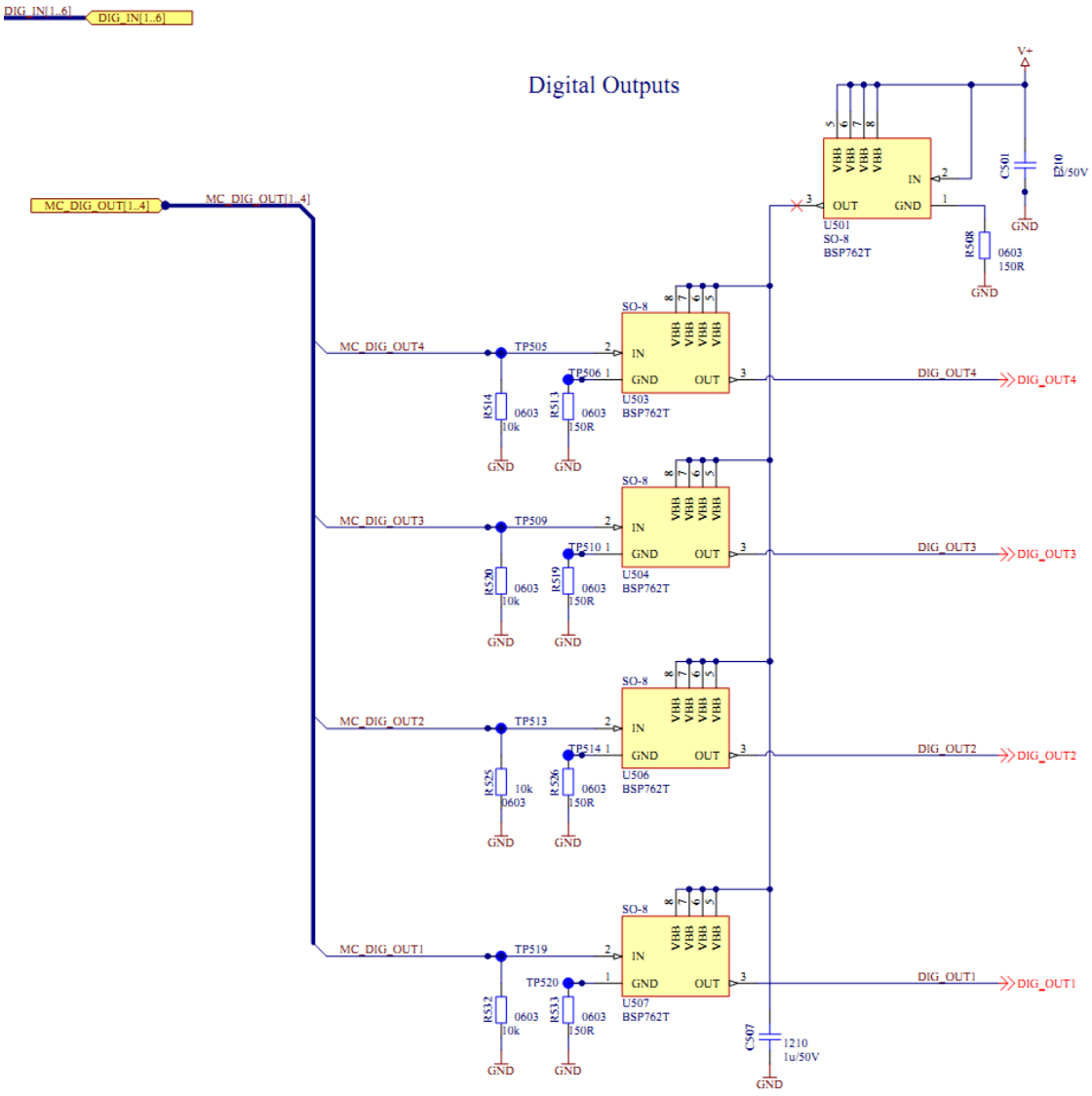
Figure 2: Pinout of the I/O plug

The plug is of the following type: Phoenix Contact plug part 16-pin MC1,5/16-ST-3,81 - 1803714.

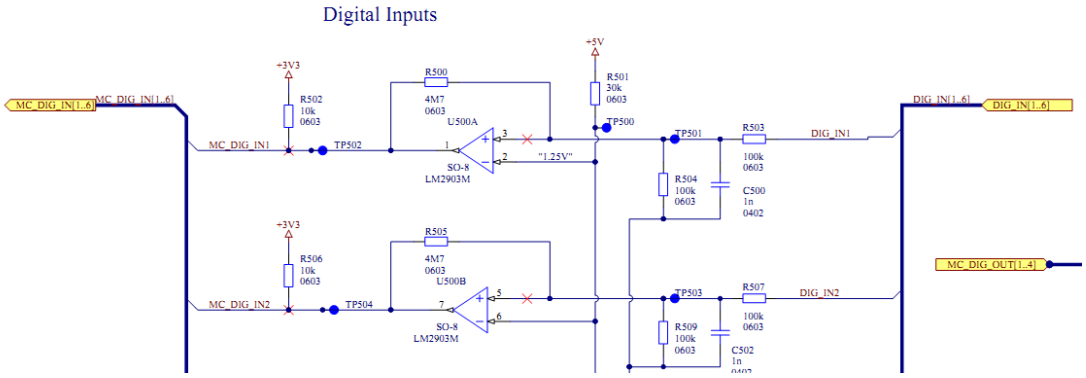


Pin No.	Signals	Description
1	GND	Ground
2	DIGOUT1	Digital output 1
3	DIGOUT2	Digital output 2
4	DIGOUT3	Digital output 3
5	DIGOUT4	Digital output 4
6	DIGIN1	Digital input 1
7	DIGIN2	Digital input 2
8	DIGIN3	Digital input 3
9	DIGIN4	Digital input 4
10	DIGIN5	Digital input 5
11	DIGIN6	Digital input 6
12	ANAIN1	Analog input 1
13	ANAIN2	Analog input 2
14	ANAOUT1	Analog output 1
15	ANAOUT2	Analog output 2
16	GND	Ground

2.3 Schematic diagram of the digital outputs



2.4 Schematic diagram of the digital inputs



3. Displays

The ETCio 100 has 4 LED displays

- PWR = Power supply voltage
- USER1 = Programmable with EtherCAT messages
- USER2 = Programmable with EtherCAT messages
- STAT = EtherCAT-status

Depending on the mode of the ETCio 100, the LED displays act as follows:

PWR-LED

The power LED (PWR) lights in green when the ETCio 100 is connected to power.

USER1- and USER2-LED

These freely programmable LED displays can be switched using messages. You can find more information in Chapter 5.10.20.

STAT-LED

The STAT LED reflects the status of the EtherCAT state machine and the error status. It is a multicolor display. The green color handles the EtherCAT status, while the red color indicates a possible error. There are three possible states for this display (off/red/green). Red and green cannot be active simultaneously. In case of a conflict, red takes priority. The following tables show the flash codes of the colors.

Run Status - Green		
○	off	No working voltage or status Initializing
✪	200 ms	Status Pre-Operational
✪	200/1000 ms	Status Safe-Operational
●		Status Operational
✪	50 ms	Status Bootstrap

Table 3-1: STAT LED: green

Error status - Red

○	off	No working voltage or no error
✪	200 ms	Incorrect configuration
✪	200/1000 ms	Local error
●		Application error

Table 3-2: ºSTAT LED: Red

4. Functional description

4.1 Power supply

The ETCio 100 is supplied with direct current from 6-32 V and is protected against polarity errors as well as low and high voltage. In case of a polarity error or low voltage, it turns off. For overvoltage, an internal fuse may blow. In the case that the internal fuse has blown, the ETCio 100 is no longer ready to operate and must be returned to IXXAT for repair.

4.2 Digital outputs

The digital outputs work with a high-side switch that is supplied from the power supply (PWR). Output voltages are therefore available depending on the power supply voltage. The digital outputs can be loaded with a current up to 2 A. The total current through all outputs should not exceed 2 A in order to ensure error-free operation. The outputs are protected against excessive current, overheating, and short circuit.

The digital outputs and the digital inputs are operated together from the power supply (PWR). It must therefore be noted that any change in the power supply voltage (PWR) will influence the output voltage on the digital outputs as well as the switching voltage of the digital inputs.

4.3 Digital inputs

The digital inputs work with a comparator that is supplied with half the power supply voltage (PWR). The input voltage can be varied over a range from 6-32 V, making the switching voltage 3-16 V depending on the power supply voltage.

Example:
If the power supply voltage (PWR) is 12V, then the switching voltage is ½ * 12 V = 6 V.

Input voltages on the digital input of less than 6 V are shown as "0". Input voltages on the digital input of more than 6 V are shown as "1".

A hysteresis of about 50 mV ensures the error-free function of the switching threshold. The digital inputs have a low-pass filter to minimize interference. A simple first-degree filter with one RC circuit set to a boundary frequency (3 dB) of about 1 kHz is used as the filter.

The digital outputs and the digital inputs are operated together from the power supply (PWR). It must therefore be noted that any change in the power supply voltage (PWR) will influence the output voltage on the digital outputs as well as the switching voltage of the digital inputs.

4.4 Analog inputs

The ETCio 100 has two analog inputs with an input amplifier that can be queried using an EtherCAT message. You can find more information about this in Section 5.1.6.

The analog inputs work over a voltage range from 0-10 V with a 12-bit analog/digital converter. The voltage is measured between the two connections ANAINx and ground (GND).

The inputs are protected up to 60 V. The inputs have a low-pass filter to minimize interference. A simple first-degree filter with one RC circuit set to a boundary frequency (3 dB) of about 1 kHz is used as the filter. The input resistance is about 100 kΩ.

The voltage on the input for an input range of 0-10 V can be calculated from the AD value:

U_{ANAIN} = AD-value / 4095 * 3.30 / 100 * 33 [V]

Simplified:

V_{ANAIN} = AD value * 2.6593 [mV]

With: V_{ANAIN}: Voltage on the analog input
AD-value: Value of the analog input in the EtherCAT message.
The AD value is always set from 0 to 4095.

The analog input thus has a resolution of 2.6593 mV.

The ETCio 100 is a high-quality instrument for the measurement of voltage. To increase the precision in the application, the ETCio 100 may require calibration.

To do this, the user must measure and record a number of different voltage values for each channel, and use them to calculate a correction curve or table.

4.5 Analog outputs

The ETCio 100 has two channels with a resolution of 12 bits. The analog outputs can be set using EtherCAT messages. You can find more information about this in Section 5.1.4.1

The internal reference voltage source and the DAC itself have an accuracy of 0.2%. The output current is limited to 20 mA. If this current is exceeded, then the corresponding output is turned off. Software can be used to switch the following output ranges for each individual analog output: +5 V, +10 V, +10.8 V.

The voltage on the output can be calculated using the following formulas:

V_{ANAOUT}: AD value / 4096 * output range [V]

With: V_{ANAOUT}: Voltage on the analog output
AD-value: Value of the analog output in the message.
The AD value is always set from 0 to 4095.
Output range: 5, 10 or 10.8

5. Software

It is assumed that the reader of this document is familiar with the EtherCAT standard. So the usual EtherCAT mechanisms will not be described or will be described only superficially.

Abbreviations / definitions in this chapter:

0xnn	Hexadecimal numbers
AO	Analog output
ARRAY	EtherCAT object whose subindexes are of identical data types. Subindex 0 is generally excepted from this rule.
DI	Digital input
DO	Digital output
IO	Inputs and outputs
RECORD	EtherCAT object whose subindexes are of different data types.
RO	Read access
RW	Read and write access
SI	Subindex
STRING	Character string
UINT16	Unsigned 16-bit value
UINT32	Unsigned 32-bit value
UINT8	Unsigned 8-bit value
VAR	EtherCAT object consisting of exactly one value
WO	Write access
AI	Analog input

5.1 Device Description File

The Device Description File is an XML file. It contains information for an EtherCAT master that describes the ETCio 100. Further information can be found in the following document:

„EtherCAT Slave Information, Specification“ (ETG)

5.2 Device profile

The ETCio 100 has the device profile "Generic I/O Device". Thus the ETCio 100 is based on the CANopen device profile 401. Further information can be found in the following document:

“CANopen, Device profile for generic I/O modules” (CiA)

5.3 ESI EEPROM

The ESI EEPROM contains the "Slave Information Interface Area (SII)". This defines, among other things, settings for the connection between the EtherCAT slave controller and the microcontroller.

The content of this buffer can be configured from the EtherCAT master.

An incorrect configuration in the parameters "PDI Control" and "PDI Configuration" can lead to the ETCio 100 no longer being addressable using EtherCAT mechanisms. Thus every time it starts, the device checks whether the correct value is in these fields. If not, the complete EEPROM is described with the following standard values:

- PDI Control: 0x3205
- PDI Configuration: 0x0003
- Checksum: Correct checksum
- Vendor ID: 0x00000004
- Product Code: 0x00000006
- Version No: 0x00010001

All other values are set to 0.

This ensures that even if the configuration is incorrect the ETCio 100 is still reachable.

These values, except for the serial number field, correspond to the factory settings.

5.3.1 Factory settings

The following steps describe how the ESI EEPROM can be reset to the factory settings.

1. PDI Control (word address 0x0000) described with a value not equal to 0x3205, for example: 0x0000.
2. Carry out a power cycle.
3. Convert the device's serial number without the leading "HW" into a hexadecimal number, for example: HW123456 → 0x1E240
4. Enter the calculated value into the field "Serial Number" (word address 0x000E).
5. Configure the I/Os with the default values corresponding to chapter 5.7.2.

5.4 Protocols supported

The following mailbox protocols are supported:

- CoE (CAN application protocol over EtherCAT services)
- FoE (File access with EtherCAT services)

FoE is only supported in Bootstrap status. See Section 5.9.

5.5 Synchronization

The following synchronization protocols are supported:

- Free Run
- SM Synchronous

5.6 EtherCAT-status

The following EtherCAT states are supported:

- Init
- Preop
- Safeop
- Op
- Bootstrap

5.7 Input /Output

5.7.1 Values

Access to the IOs can take place by SDO access or through the PDOs. Table 5-1 shows the corresponding CoE objects.

Section 5.8 describes the process data in more detail.

Section 5.10 describes the CoE objects in more detail.

Index	Name	Description
0x6000	Read input 8 bit	The value of all digital inputs, summarized as an 8-bit value.
0x6200	Write output 8-bit	The value of all digital outputs, summarized as an 8-bit value.
0x6401	Read analog input 16-bit	Values from the analog inputs.
0x6411	Write analog output 16-bit	Values from the analog outputs.

Table 5-1: Objects for IO configuration

5.7.2 Configuration

The IOs can be configured. The objects listed in Table 5-2 are available for this purpose. A more detailed description of the objects can be found in Section 5.10.

For each category of IO, the number of channels can be configured. In the following sections, additional special configuration options will be explained for each category.

The last configuration saved will be accepted the next time the device starts. If an invalid configuration is detected, the following default configuration will be used and a diagnostic message output. The diagnostic message is described in Section 5.7.3.

- Number of DI: 6
- Sample time for each DI: 1 ms
- Number of DO: 4
- Standard value of each DO: 0
- Number of AI: 2
- Number of AO: 2
- Standard value of each AO: 0
- Voltage range of each AO: 0 V up to 10 V

Index	Name	Description
0x2000	Config Digital Inputs	Configuration of digital inputs. See Section 5.10.16.
0x2001	Config Digital Outputs	Configuration of the digital outputs. See Section 5.10.17.
0x2002	Config Analog Inputs	Configuration of the analog inputs. See Section 5.10.18.
0x2003	Config Analog Outputs	Configuration of the analog outputs. See Section 5.10.19.
0x2004	Store Parameters	Save the current configuration. See Section 5.10.20.
0x2005	Restore Parameters	Load the last configuration saved. See Section 5.10.21.

Table 5-2: Objects for IO configuration

5.7.2.1 Digital inputs

For each digital input, the sample time can be configured in 10 µs steps. The value of a digital input is considered a valid value once three identical values are read separated by the sample time. Figure 5-1 shows an example:

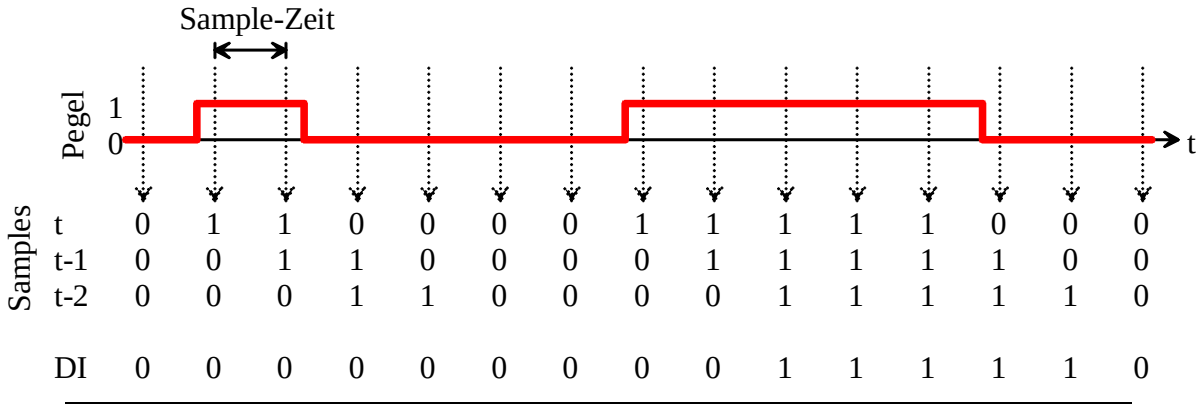


Figure 5-1: DI sample time

5.7.2.2 Digital outputs

For each digital output, a default value can be configured. This remains valid until another value is defined via SDO or PDO. Thus the value is defined when the device starts.

The default value equates the safe state.

5.7.2.3 Analog inputs

Aside from the number of channels, there are no special configuration options.

5.7.2.4 Analog outputs

For each analog output, a default value can be configured. This remains valid until another value is defined via SDO or PDO. Thus the value is defined when the device starts.

The voltage range can also be defined. Table 5-3 shows the possible voltage ranges and the conversion of the calculated values into a voltage.

The default value equates the safe state.

Value	Voltage range	Conversion
0	0 V up to 5 V	$U_{AO} = \frac{DO * 5}{4096}$
1	0 V up to 10 V	$U_{AO} = \frac{DO * 10}{4096}$
2	0 V up to 10.7 V	$U_{AO} = \frac{DO * 10{,}7}{4096}$

Table 5-3: AO Voltage range

5.7.3 Diagnostic message

When the device starts, it checks whether the configuration is valid. It can for example be invalid if more than the maximum number of channels are configured.

If the configuration is invalid, then a diagnostic message of type "Error" with the message content "Incorrect configuration" is output.

With the ETCio 100, only this single diagnostic message can occur. This permits it easily to be checked whether the current configuration is valid or not:

- If no diagnostic message is present after the device starts, then the configuration is valid.
- If a diagnostic message is present after the device starts, then the configuration is invalid.

5.8 Process data

The values of the IOs can be accessed through the process data.

The CoE objects listed in Table 5-4 define the mapping of the process data. Section 5.10 shows the contents of these objects and thus the definition of the PDOs.

The mapping is static. The PDOs are always the same, regardless of the IO configuration.

Index	Name	Description
0x1600	1st receive PDO Mapping	Mapping DO
0x1601	2nd receive PDO Mapping	Mapping AO
0x1A00	1st transmit PDO Mapping	Mapping DI
0x1A01	2nd transmit PDO Mapping	Mapping DO

Table 5-4: Process data Mapping

5.9 Firmware-Update

A firmware update can take place in BOOSTRAP status. To do this, the FoE protocol is used to transmit a file to the ETCio 100.

The ETCio 100 will only accept a file with the following name: "ECATFW__"

A file is only accepted in BOOTSTRAP mode.

A newly loaded firmware only becomes active after a power cycle has been carried out.

The version of the firmware is in object 0x100A: "Manufacturer Software Version" (see Section 5.10.3)

5.10 CoE-Objects

Table 5-5 lists the entire CoE object module of the ETCio 100.

The following sections will describe the objects. Objects 0x1000 to 0x1FFFh are not completely described here. For a complete description, we refer to the EtherCAT standard.

Index	SI	Name
0x1000	-	Device Type
0x1008	-	Manufacturer Device Name
0x100A	-	Manufacturer Software Version
0x1018	0	Identity Object
	1	Vendor ID:
	2	Product Code
	3	Revision Number
	4	Serial Number
0x10F3	0	Diagnosis History
	1	Maximum Messages
	2	Newest Message
	3	Newest Acknowledge Message
	4	New Messages Available
	5	Flags
	6	Diagnosis message
0x10F8	-	Timestamp Object
0x1600	0	1st receive PDO Mapping
	1	PDO Object 1
0x1601	0	2nd receive PDO Mapping
	1	PDO Object 1
	2	PDO Object 2
0x1A00	0	1st transmit PDO Mapping
	1	PDO Object 1
0x1A01	0	2nd transmit PDO Mapping
	1	PDO Object 1
	2	PDO Object 2
0x1C00	0	Sync Manager Communication Type
	1	
	2	
	3	
	4	
0x1C12	0	Sync Manager 2 PDO Asignment
	1	
	2	
0x1C13	0	Sync Manager 3 PDO Assignment

	1	
	2	
0x1C32	0	Sync Manager Synchronization
	1	Synchronization Type
	2	Cycle Time
	3	Shift Time
	4	Synchronization Types supported
	5	Minimum Cycle Time
	6	Calc and Copy Time
	7	Minimum Delay time
	8	Get Cycle Time
	9	Delay Time
	10	Sync0 Cycle Time
	11	SM-Event missed
	12	Cycle Time Too Small
	13	Shift Time Too Short
	32	Sync error
0x1C33	0	Sync Manager Synchronization
	1	Synchronization Type
	2	Cycle Time
	3	Shift Time
	4	Synchronization Types supported
	5	Minimum Cycle Time
	6	Calc and Copy Time
	7	Minimum Delay time
	8	Get Cycle Time
	9	Delay Time
	10	Sync0 Cycle Time
	11	SM-Event missed
	12	Cycle Time Too Small
	13	Shift Time Too Short
	32	Sync error
0x2000	0	Config Digital Inputs
	1	Number of DI
	2	DI1 debouncing time
	3	DI2 debouncing time
	4	DI3 debouncing time
	5	DI4 debouncing time
	6	DI5 debouncing time
	7	DI6 debouncing time
0x2001	0	Config Digital Outputs
	1	Number of DO
	2	DO1 default value

	3	DO2 default value
	4	DO3 default value
	5	DO4 default value
0x2002	0	Config Analog Inputs
	1	Number of AI
0x2003	0	Config Analog Outputs
	1	Number of AO
	2	AO1 default value
	3	AO2 default value
	4	AO3 default value
	5	AO4 default value
0x2004	0	Store Parameters
	1	
0x2005	0	Restore Parameters
	1	
0x2006	0	USER LEDs
	1	USER LED 1
	2	USER LED 2
0x2007	0	Additional informations
	1	Bootloader version
0x2008	0	SW-Reset
	1	Execute Reset
0x6000	0	Read input 8 bit
	1	
0x6200	0	Write output 8-bit
	1	
0x6401	0	Read analog input 16-bit
	1	
	2	
0x6411	0	Write analog output 16-bit
	1	
	2	

Table 5-5: CoE-Objects

5.10.1 0x1000: Device Type

This object specifies the device type and device profile.

- Object type: VAR
- Value: See Table 5-7

SI	Type	Access	Name
-	UINT32	RO	Device Type

Table 5-6: 0x1000: Device Type

Bit	Value	Description
0-15	401	Device profile 401 = generic I/O module
16	1	Digital inputs 1 = implemented 0 = not implemented
17	1	Digital outputs 1 = implemented 0 = not implemented
18	1	Analog inputs 1 = implemented 0 = not implemented
19	1	Analog outputs 1 = implemented 0 = not implemented
20-22	0	Reserved
23	0	Mapping 0 = PDO mapping according to device profile 1 = device-specific PDO mapping

Table 5-7: 0x1000: Device Type: Value

5.10.2 0x1008: Manufacturer Device Name

This object contains the device name.

- Object type: VAR
- Value: “ETCio 100”

SI	Type	Access	Name
-	STRING	RO	Manufacturer Device Name

Table 5-8: 0x1008: Manufacturer Device Name

5.10.3 0x100A: Manufacturer Software Version

This object contains the software version.

- Object type: VAR
- Value: Version of the software in format A.BB.CC (see Table 5-10).

SI	Type	Access	Name
-	STRING	RO	Manufacturer Device Name

Table 5-9: 0x100A: Manufacturer Software Version

Char	Value	Description
0	for example “1”	A: Version number based on large changes.
1	“.”	Separator
2-3	for example “00”	BB: Version number indicating small changes visible externally.
4	“.”	Separator
5-6	for example “00”	CC: Version number indicating small changes not visible externally.

Table 5-10: 0x100A: Manufacturer Software Version: Value

5.10.4 0x1018: Identity Object

This object contains general information about the EtherCAT device.

- Object type: RECORD

SI	Type	Access	Name	Value
0	UINT8	RO	Identity Object	Number of the highest subindex of this object.
1	UINT32	RO	Vendor ID:	4 (= IXXAT)
2	UINT32	RO	Product Code	6 (= ETCio 100)
3	UINT32	RO	Revision Number	0x00010001
4	UINT32	RO	Serial Number	Serial number

Table 5-11: 0x1018: Identity Object

5.10.5 0x10F3: Diagnosis History

This object can include a diagnostic view.

See also Section 5.7.3.

- Object type: RECORD

SI	Type	Access	Name
0	UINT8	RO	Diagnosis History
1	UINT8	RO	Maximum Messages
2	UINT8	RO	Newest Message
3	UINT8	RW	Newest Acknowledge Message
4	BOOL	RO	New Messages Available
5	UINT16	RW	Flags
6	STRING	RO	Diagnosis message

Table 5-12: 0x10F3: Diagnosis History

5.10.5.1 SI0: Diagnosis History

Number of the highest subindex of this object.

5.10.5.2 SI1: Maximum Messages

Maximum number of diagnostic messages. Since the ETCio 100 outputs at most one diagnostic message, the value of this subindex is 1.

5.10.5.3 SI2: Newest Message

Subindex of the latest diagnostic message. Table 5-13 shows the possible values.

Value	Description
0	No diagnostic message
6	A diagnostic message

Table 5-13: 0x10F3: Newest Message: Value

5.10.5.4 SI3: Newest Acknowledge Message

This subindex can be used to acknowledge the diagnostic message.

Table 5-14 shows the possible values.

Value	Description
0	No message acknowledged
6	Diagnostic message acknowledged

Table 5-14: 0x10F3: Newest Acknowledge Message: Value

5.10.5.5 SI4: New Messages Available

Specifies whether the latest diagnostic message has already been read.

Value	Description
0	Latest message already read
1	Latest message not read

Table 5-15: 0x10F3: Newest Acknowledge Message: Value

5.10.5.6 SI5: Flags

Settings for the diagnostic message object. Write access is possible for some bits. Table 5-18 describes this in more detail.

Bit	Value	Access	Description
0	0	RO	0: Device does not support the "Emergency sending" functionality. 1: New diagnostic messages are sent as "Emergency message".
1	0	RW	0: Diagnostic messages of type "Info" are saved. 1: Diagnostic messages of type "Info" are not saved and thus suppressed.
2	0	RW	0: Diagnostic messages of type "Warning" are saved. 1: Diagnostic messages of type "Warning" are not saved and thus suppressed.
3	0	RO	0: Diagnostic messages of type "Error" are saved. 1: Diagnostic messages of type "Error" are not saved and thus suppressed.
4	0	RO	0: Overwrite Mode. Old messages are overwritten by new messages when the memory is full. 1: Acknowledge mode. New messages only overwrite messages that have already been acknowledged.
5	0	RO	If the value is 1, an unacknowledged message has been overwritten. This cannot happen in the ETCio 100 because at most one diagnostic message can appear.
6-15	0	RO	reserved

Table 5-16: 0x10F3: Flags: Value

5.10.5.7 SI6: Diagnosis message

If present: There is a diagnostic message.

If not present: There is no diagnostic message.

5.10.6 0x10F8: Timestamp Object

This object contains the local time of the ETCio 100.

- Object type: VAR
- Value: Local time value of the ETCio 100 in ns.

SI	Type	Access	Name
-	UINT64	RO	Timestamp Object

Table 5-17: 0x10F8: Timestamp Object

5.10.7 10x1600: 1st receive PDO Mapping

This object defines the mapping for the first receive PDO. This contains the values from the digital outputs.

See also Section 5.8.

- Object type: RECORD

SI	Type	Access	Name
0	UINT8	RO	1st receive PDO Mapping
1	UINT32	RO	PDO Object 1

Table 5-18: 0x1600: 1st receive PDO Mapping

5.10.7.1 SI0: 1st receive PDO Mapping

Number of the highest subindex of this object.

5.10.7.2 SI1: PDO Object 1

This subindex describes the mapping of this PDO. Table 5-19 shows the content.

Bit	Value	Description
0-7	0x08	Length in the PDO in bits.
8-15	0x01	Subindex of the mapped object.
16-31	0x6200	Index of the mapped object: Write output 8-bit

Table 5-19: 0x1600: PDO Object 1: Wert

5.10.8 0x1601: 2nd receive PDO Mapping

This object defines the mapping for the second receive PDO. This contains the values from the analog outputs.

See also Section 5.8.

- Object type: RECORD

SI	Type	Access	Name
0	UINT8	RO	2nd receive PDO Mapping
1	UINT32	RO	PDO Object 1
2	UINT32	RO	PDO Object 2

Table 5-20: 0x1601: 2nd receive PDO Mapping

5.10.8.1 SI0: 2nd receive PDO Mapping

Number of the highest subindex of this object.

5.10.8.2 SI1: PDO Object 1

This subindex describes the mapping of this PDO. Table 5-21 shows the content.

Bit	Value	Description
0-7	0x10	Length in the PDO in bits.
8-15	0x01	Subindex of the mapped object.
16-31	0x6411	Index of the mapped object: Write analog output 16-bit

Table 5-21: 0x1601: PDO Object 1: Value

5.10.8.3 SI2: PDO Object 2

This subindex describes the mapping of this PDO. Table 5-22 shows the content.

Bit	Value	Description
0-7	0x10	Length in the PDO in bits.
8-15	0x02	Subindex of the mapped object.
16-31	0x6411	Index of the mapped object: Write analog output 16-bit

Table 5-22: 0x1601:PDO Object 2: Value

5.10.9 0x1A00: 1st transmit PDO Mapping

This object defines the mapping for the first transmit PDO. This contains the values from the digital inputs.

See also Section 5.8.

- Object type: RECORD

SI	Type	Access	Name
0	UINT8	RO	1st transmit PDO Mapping
1	UINT32	RO	PDO Object 1Maximum Messages

Table 5-23: 0x1A00: 1st transmit PDO Mapping

5.10.9.1 SI0: 1st transmit PDO Mapping

Number of the highest subindex of this object.

5.10.9.2 SI1: PDO Object 1

This subindex describes the mapping of this PDO. Table 5-24 shows the content.

Bit	Value	Description
0-7	0x08	Length in the PDO in bits.
8-15	0x01	Subindex of the mapped object.
16-31	0x6000	Index of the mapped object: Read input 8 bit

Table 5-24: 0x1A00: PDO Object 1: Value

5.10.10 0x1A01: 2nd transmit PDO Mapping

This object defines the mapping for the second transmit PDO. This contains the values from the analog inputs.

See also Section 5.8.

- Object type: RECORD

SI	Type	Access	Name
0	UINT8	RO	2nd transmit PDO Mapping
1	UINT32	RO	PDO Object 1
2	UINT32	RO	PDO Object 2

Table 5-25: 0x1A01: 2nd transmit PDO Mapping

5.10.10.1 SI0: 2nd transmit PDO Mapping

Number of the highest subindex of this object.

5.10.10.2 SI1: PDO Object 1

This subindex describes the mapping of this PDO. Table 5-26 shows the content.

Bit	Value	Description
0-7	0x10	Length in the PDO in bits.
8-15	0x01	Subindex of the mapped object.
16-31	0x6401	Index of the mapped object: Read analog input 16-bit

Table 5-26: 0x1A01: PDO Object 1: Value

5.10.10.3 SI2: PDO Object 2

This subindex describes the mapping of this PDO. Table 5-27 shows the content.

Bit	Value	Description
0-7	0x10	Length in the PDO in bits.
8-15	0x02	Subindex of the mapped object.
16-31	0x6401	Index of the mapped object: Read analog input 16-bit

Table 5-27: 0x1A01: PDO Object 2: Value

5.10.11 0x1C00: Sync Manager Communication Type

This object defines the number and type of communication channels.

- Object type: ARRAY

SI	Type	Access	Value
0	UINT8	RO	Number of the highest subindex of this object.
1	UINT8	RO	1: mailbox receiver (Master -> Slave)
2	UINT8	RO	2: mailbox send (Slave -> Master)
3	UINT8	RO	3: process data output (Master -> Slave)
4	UINT8	RO	4: process data input (Slave -> Master)

Table 5-28: 0x1C00: Sync Manager Communication Type

5.10.12 0x1C12: Sync Manager 2 PDO Asignment

This object is used to assign a sync manager to the PDOs.

- Object type: ARRAY

SI	Type	Access	Value
0	UINT8	RO	Number of the highest subindex of this object.
1	UINT16	RO	0x1600: RxPDO 1
2	UINT16	RO	0x1601: RxPDO 2

Table 5-29: 0x1C12: Sync Manager 2 PDO Asignment

5.10.13 0x1C13: Sync Manager 3 PDO Assignment

This object is used to assign a sync manager to the PDOs.

- Object type: ARRAY

SI	Type	Access	Value
0	UINT8	RO	Number of the highest subindex of this object.
1	UINT16	RO	0x1A00: TxPDO 1
2	UINT16	RO	0x1A01: TxPDO 2

Table 5-30: 0x1C13: Sync Manager 3 PDO Assignment

5.10.14 0x1C32: Sync Manager Synchronization

This object makes information available about the synchronization. The synchronization can also be configured using this object. The parameters are not described completely in Table 5-31. For a complete description, we refer to the EtherCAT standard.

- Object type: RECORD

SI	Type	Access	Name	Value
0	UINT8	RO	Sync Manager Synchroniza-tion	Number of the highest subindex of this object.
1	UINT16	RW	Synchroniza-tion Type	0x00: Free Run 0x01: Synchronous
2	UINT32	RW	Cycle Time	If Synchronization Type = 0x00: Time between two local timer events in ns. If Synchronization Type = 0x01: Minimum time between two SM2 events in ns.
3	UINT32	RO	Shift Time	Time between event and as-signed action in ns.
4	UINT16	RO	Synchroniza-tion Types supported	Bit 0, Value 0: Free run not sup-ported. Bit 0, Value 1: Free run support-ed. Bit 1, Value 0: Sync mode not supported. Bit 1, Value 1: Sync mode sup-ported. Bit 2-4, Value 0: DC not support-ed. Bit 5-6, Value 0: Shift not sup-ported. Bit 14, Value 0: The cycle time is fixed. Values other than those listed are not needed. Other bits are either unneeded or reserved.
5	UINT32	RO	Minimum Cy-cle Time	Minimum cycle time supported by the ETCio 100. Value in ns. Only used in Sync mode.
6	UINT32	RO	Calc and Copy Time	Time for local processing of pro-cess data in ns.
7	UINT32	RO	Minimum De-lay time	Not needed for the ETCio 100.
8	UINT16	RW	Get Cycle Time	Bit 0, Value 0: Measurement of local cycle time stopped. Bit 0, Value 1: Measurement of local cycle time started. Bit 1, Value 1: Reset of error counter. Other bits: reserved

9	UINT32	RO	Delay Time	Not needed for the ETCio 100.
10	UINT32	RW	Sync0 Cycle Time	Not needed for the ETCio 100.
11	UINT16	RO	SM-Event missed	Not needed for the ETCio 100.
12	UINT16	RO	Cycle Time Too Small	Error counter for cycle times that are too small.
13	UINT16	RO	Shift Time Too Short	Not needed for the ETCio 100.
32	BOOL	RO	Sync error	0: No synchronization error or Sync error not supported. 1: Synchronization error

Table 5-31: 0x1C32: Sync Manager Synchronization

5.10.15 0x1C33: Sync Manager Synchronization

This object makes information available about the synchronization. The synchronization can also be configured using this object. The parameters are not described completely in Table 5-34. For a more detailed description, we refer to the EtherCAT specification.

- Object type: RECORD

SI	Type	Access	Name	Value
0	UINT8	RO	Sync Manager Synchronization	Number of the highest subindex of this object.
1	UINT16	RW	Synchronization Type	0x00: Free Run 0x01: Synchronous
2	UINT32	RW	Cycle Time	Same value as in object index 0x1C32, subindex 2.
3	UINT32	RO	Shift Time	Time between event and assigned action in ns.
4	UINT16	RO	Synchronization Types supported	Bit 0, Value 0: Free run not supported. Bit 0, Value 1: Free run supported. Bit 1, Value 0: Sync mode not supported. Bit 1, Value 1: Sync mode supported. Other bits are either unneeded or reserved.
5	UINT32	RO	Minimum Cycle Time	Same value as in object index 0x1C32, subindex 5.

6	UINT32	RO	Calc and Copy Time	Time for local processing of process data in ns.
7	UINT32	RO	Minimum Delay time	Reserved
8	UINT16	RW	Get Cycle Time	Same value as in object index 0x1C32, subindex 8.
9	UINT32	RO	Delay Time	Not needed for the ETCio 100.
10	UINT32	RW	Sync0 Cycle Time	Same value as in object index 0x1C32, subindex 10.
11	UINT16	RO	SM-Event missed	Same value as in object index 0x1C32, subindex 11.
12	UINT16	RO	Cycle Time Too Small	Same value as in object index 0x1C32, subindex 12.
13	UINT16	RO	Shift Time Too Short	Same value as in object index 0x1C32, subindex 13.
32	BOOL	RO	Sync error	Same value as in object index 0x1C32, subindex 32.

Table 5-32: 0x1C33: Sync Manager Synchronization

5.10.16 0x2000: Config Digital Inputs

This object is responsible for the configuration of the digital inputs.

See also Section 5.7.2.

- Object type: RECORD
- Backup object

SI	Type	Access	Name
0	UINT8	RO	Config Digital Inputs
1	UINT8	RW	Number of DI
2	UINT8	RW	DI1 debouncing time
3	UINT8	RW	DI2 debouncing time
4	UINT8	RW	DI3 debouncing time
5	UINT8	RW	DI4 debouncing time
6	UINT8	RW	DI5 debouncing time
7	UINT8	RW	DI6 debouncing time

Table 5-33: 0x2000: Config Digital Inputs

5.10.16.1 SI0: Config Digital Inputs

Number of the highest subindex of this object.

5.10.16.2 SI1: Number of DI

Number of digital inputs.
Unused digital inputs always show the value '0'.

Value	Digital outputs used
0	-
1	DIGIN1
2	DIGIN1, DIGIN2
3	DIGIN1, DIGIN2, DIGIN3
4	DIGIN1,DIGIN2,DIGIN3,DIGIN4
5	DIGIN1,DIGIN2,DIGIN3,DIGIN4,DIGIN5
6	DIGIN1,DIGIN2,DIGIN3,DIGIN4,DIGIN5,DIGIN6,

Table 5-34: 0x2000: Number of DI: Value

5.10.16.3 SI2-7

Sample time for a digital input in units of 10 µs.
Sample time = Value * 10 µs

5.10.17 0x2001: Config Digital Outputs

This object is responsible for the configuration of the digital outputs.
See also Section 5.7.2.

- Object type: RECORD
- Backup object

SI	Type	Access	Name
0	UINT8	RO	Config Digital Outputs
1	UINT8	RW	Number of DO
2	BOOL	RW	DO1 default value
3	BOOL	RW	DO2 default value
4	BOOL	RW	DO3 default value
5	BOOL	RW	DO4 default value

Table 5-35: 0x2001: Config Digital Outputs

5.10.17.1 SI0: Config Digital Outputs

Number of the highest subindex of this object.

5.10.17.2 SI1: Number of DO

Number of the digital outputs.

Unused digital outputs are set to '0' and the value cannot be changed by PDO or SDO.

Value	Digital outputs used
0	-
1	DIGOUT1
2	DIGOUT1,DIGOUT2
3	DIGOUT1,DIGOUT2DIGOUT3
4	DIGOUT1,DIGOUT2,DIGOUT3, DIGOUT4

Table 5-36: 0x2001: Number of DO: Value

5.10.17.3 SI2-5: DO1 default value

Default value of a digital output.

5.10.18 0x2002: Config Analog Inputs

This object is responsible for the configuration of the analog inputs.

See also Section 5.7.2.

- Object type: RECORD
- Backup object

SI	Type	Access	Name
0	UINT8	RO	Config Analog Inputs
1	UINT8	RW	Number of AI

Table 5-37: 0x2002 - Config Analog Inputs

5.10.18.1 SI0: Config Analog Inputs

Number of the highest subindex of this object.

5.10.18.2 SI1: Number of AI

Number of analog inputs.
Unused analog inputs always show the value '0'.

Value	Digital outputs used
0	-
1	ANAIN1
2	ANAIN1, ANAIN2

Table 5-38: 0x2002: Number of AI: Value

5.10.19 0x2003: Config Analog Outputs

This object is responsible for the configuration of the analog outputs.
See also Section 5.7.2.

- Object type: RECORD
- Backup object

SI	Type	Access	Name
0	UINT8	RO	Config Analog Outputs
1	UINT8	RW	Number of AO
2	UINT16	RW	AO1 default value
3	UINT16	RW	AO2 default value
4	UINT16	RW	AO3 default value
5	UINT16	RW	AO4 default value

Table 5-39: 0x2003: Config Analog Outputs

5.10.19.1 SI0: Config Analog Outputs

Number of the highest subindex of this object.

5.10.19.2 SI1: Number of AO

Number of analog outputs.
Unused analog outputs are set to '0' and the value cannot be changed by PDO or SDO.

Value	Digital outputs used
0	-
1	ANAOUT1
2	ANAOUT1, ANAOUT2

Table 5-40: 0x2003: Number of AO: Value

5.10.19.3 SI2-5

Default value of an analog output.

Bit	Description
0-11	Value of the analog output
12-15	Value is not used

Table 5-41: 0x2003: SI2-5: Value

5.10.20 0x2004: Store Parameters

This object can be used to store backup objects. Each IO configuration object is a backup object. This object can thus be used to save the IO configuration.

- Object type: ARRAY

SI	Type	Access
0	UINT8	RO
1	UINT32	RW

Table 5-42: 0x2004: Store Parameters

5.10.20.1 SI0: Store Parameters

Number of the highest subindex of this object.

5.10.20.2 SI1: Store Parameters

If the value defined in Table 5-43 is entered, then the ETCio 100 saves all backup objects in a non-volatile memory.

A write access is only possible in pre-op mode. See also Section 5.7.2.

Value	Description
0x65766173	The value corresponds to the character string "save". If this value is written, then all backup objects are stored in non-volatile storage.
Every other	No effect.

Table 5-43: 0x2004: Store Parameters: Value

5.10.21 0x2005: Restore Parameters

This object can be used to reset the values of backup objects to the last values saved.

- Object type: ARRAY

SI	Type	Access
0	UINT8	RO
1	UINT32	RW

Table 5-44: 0x2005: Restore Parameters

5.10.21.1 SI0: Restore Parameters

Number of the highest subindex of this object.

5.10.21.2 SI1: Restore Parameters

If the value defined in Table 5-36 is entered, then the contents of all backup objects are set to the last value saved.

See also Section 5.7.2.

Value	Description
0x64616F6C	The value corresponds to the character string "load". If this value is entered, then the contents of all backup objects are set to the last value saved.
Every other	No effect.

Table 5-45: 0x2005: Restore Parameters: Value

5.10.22 0x2006: USER LEDs

This object is responsible for the controlling of the USER LEDs. An EtherCAT master can thus turn the USER LEDs on or off and define the color.

- Object type: RECORD

SI	Type	Access	Name
0	UINT8	RO	USER LEDs
1	UINT8	RW	USER LED 1
2	UINT8	RW	USER LED 2

Table 5-46: 0x2006: USER LEDs

5.10.22.1 SI0: USER LEDs

Number of the highest subindex of this object.

5.10.22.2 SI1: USER LED 1

Settings for the LED colors according to the following table.

Value	LED
1	red
2	green
Other value	of

Table 5-47: 0x2006: USER LED 1: Value

5.10.22.3 SI2: USER LED 2

Settings for the LED colors according to the following table.

Value	LED
1	red
2	green
Other value	of

Table 5-48: 0x2006: USER LED 2: Value

5.10.23 0x2007: Additional informations

This object provides additional device information.

SI	Type	Access	Name
0	UINT8	RO	Additional informations
1	STRING	RO	Bootloader version

Table 5-49: 0x2007: Additional informations

5.10.23.1 SI0: Additional informations

Number of the highest subindex of this object.

5.10.23.2 SI1: Bootloader version

Version of the bootloader in the format: A.BB.CC (see Table 5-50).

The bootloader is responsible for ensuring that a newly loaded firmware is used the next time the device starts. See Section 5.9.

The bootloader itself cannot be updated.

Char	Value	Description
0	for example „1“	A: Version number based on large changes.
1	„.“	Separator
2-3	for example „00“	BB: Version number indicating small changes visible externally.
4	„.“	Separator

5-6	for example „00“	CC: Version number indicating small changes not visible externally.

Table 5-50: 0x2007: Bootloader version: Value

5.10.24 0x2008: SW-Reset

This object can be used to carry out a software reset.

- Object type: RECORD

SI	Type	Access	Name
0	UINT8	RO	SW-Reset
1	UINT32	RW	Execute Reset

Table 5-51: 0x2008: SW-Reset

5.10.24.1 SI0: SW-Reset

Number of the highest subindex of this object.

5.10.24.2 SI1: Execute Reset

The ETCio 100 carries out a software reset once the value defined in Table 5-52 is written.

A write access is only possible in pre-op mode.

For a software reset, part of the hardware is also restarted. The Ethernet connections experience a link break.

When executing a software reset, it should be ensured that a link interruption will not have critical effects. For example, the EtherCAT master can ensure beforehand that all the other EtherCAT slave devices are in Init mode.

Value	Description
0x20747372	The value corresponds to the character string "rst". If this value is written, a software reset is carried out.
Every other	No effect.

Table 5-52: 0x2008: Execute Reset: Value

5.10.25 0x6000: Read input 8 bit

This object returns the values of the digital outputs.

- Object type: ARRAY

SI	Type	Access
0	UINT8	RO
1	UINT32	RO

Table 5-53: 0x6000: Read input 8 bit

5.10.25.1 SI0: Read input 8 bit

Number of the highest subindex of this object.

5.10.25.2 SI1: Read input 8 bit

Value of the digital inputs as defined in Table 5-54.
Section 5.7.2.1 describes the mechanism by which values are read in.

Bit	Description
0	Value of the digital input DIGIN1.
1	Value of the digital input DIGIN2.
2	Value of the digital input DIGIN3.
3	Value of the digital input DIGIN4.
4	Value of the digital input DIGIN5.
5	Value of the digital input DIGIN6.
6-7	0

Table 5-54: Read input 8 bit: SI1: Value

5.10.26 0x6200: Write output 8-bit

This object defines the values of the digital outputs.

- Object type: ARRAY

SI	Type	Access
0	UINT8	RO
1	UINT8	WO

Table 5-55: 0x6200: Write output 8-bit

5.10.26.1 SI0: Write output 8-bit

Number of the highest subindex of this object.

5.10.26.2 SI1: Write output 8-bit

Value of the digital outputs as defined in Table 5-56.

Bit	Description
0	Value of the digital output DIGOUT1.
1	Value of the digital output DIGOUT2.
2	Value of the digital output DIGOUT3.
3	Value of the digital output DIGOUT4.
4-7	Not used.

Table 5-56: Write output 8-bit: SI1: Value

5.10.27 0x6401: Read analog input 16-bit

This object returns the values of the analog outputs.

- Object type: ARRAY

SI	Type	Access
0	UINT8	RO
1	UINT16	RO
2	UINT16	RO

Table 5-57: 0x6401: Read analog input 16-bit

5.10.27.1 SI0: Read analog input 16-bit

Number of the highest subindex of this object.

5.10.27.2 SI1: Read analog input 16-bit

Value of the analog input as 12-bit value. See Table 5-60

Bit	Description
0-11	Value of the analog input ANAIN1.
12-15	0

Table 5-58: Read analog input 16-bit: SI1: Value

5.10.27.3 SI2: Read analog input 16-bit

Value of the analog input as 12-bit value. See Table 5-59

Bit	Description
0-11	Value of the analog input ANAIN2.
12-15	0

Table 5-59: Read analog input 16-bit: SI2: Value

5.10.28 0x6411: Write analog output 16-bit

This object defines the values of the analog outputs.

- Object type: ARRAY

SI	Type	Access
0	UINT8	RO
1	UINT16	WO
2	UINT16	WO

Table 5-60: 0x6411: Write analog output 16-bit

5.10.28.1 SI0: Write analog output 16-bit

Number of the highest subindex of this object.

5.10.28.2 SI1: Write analog output 16-bit

Value of the analog output as 12-bit value. See Table 5-61

Conversion of the 12-bit value into a voltage is carried out according to Table 5-3.

Bit	Description
0-11	Value of the analog output ANAOUT1.
12-15	Value is not used.

Table 5-61: Write analog output 16-bit: SI1: Value

5.10.28.3 SI2: Write analog output 16-bit

Value of the analog output as 12-bit value. See Table 5-62

Conversion of the 12-bit value into a voltage is carried out according to Table 5-3.

Bit	Description
0-11	Value of the analog output ANAOUT2.
12-15	Value is not used.

Table 5-62: Write analog output 16-bit: SI2: Value

6. General note

6.1 Support

Additional information about our products as well as FAQ lists and installation tips, can be found in the support area on our home page (http://www.ixxat.de). You can also obtain information there about current product version and available updates.

6.2 Returning hardware

If it is necessary for you to send hardware back to us, please ask you to download the corresponding RMA form from our home page and proceed according to the instructions on that form.

6.3 Note on the disposal of old equipment

This product falls under the ElektroG and must be disposed separately of in accordance with the ElektroG. IXXAT products that fall under the ElektroG are equipment exclusively for commercial use and are marked with the symbol of a crossed-out waste bin.

As specified in the B2B regulations, disposal according to Section 10 (2) sentence 3 of the German Electrical and Electronic Equipment Act (ElektroG) in the March 16, 2005 version is specifically required by the General Terms of Business of IXXAT and its supplements.

The General Terms of Business and their supplements as well as additional instructions for the disposal of used equipment can be downloaded at www.ixxat.de.

6.4 Note on EMC

This product is a Category A device.

If the product is used in an office or residential area, it can cause radio interference in extreme cases.

To ensure problem-free operation of the product, the following things must be noted for electromagnetic compatibility:

- Use only the accessories included
- The shield for the interfaces must be connected both to the equipment plugs and to the opposite end

6.5 FCC Compliance

Declaration of conformity

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation

FCC Identifier of the built in Bluetooth module:
PVH0939

Test remit: FCC Rules 47 CFR Part 15 / 2010-01-09
Subpart B - Class B / Section 15.107 and 15.109

in accordance with the procedures given in
ANSI C63.4-2003 – 01/2004

6.6 EC declaration of conformity

IXXAT Automation declares that the product: ETCio 100

with article number(s): 1.01.0250.10001
1.01.0250.20001
1.01.0250.20101

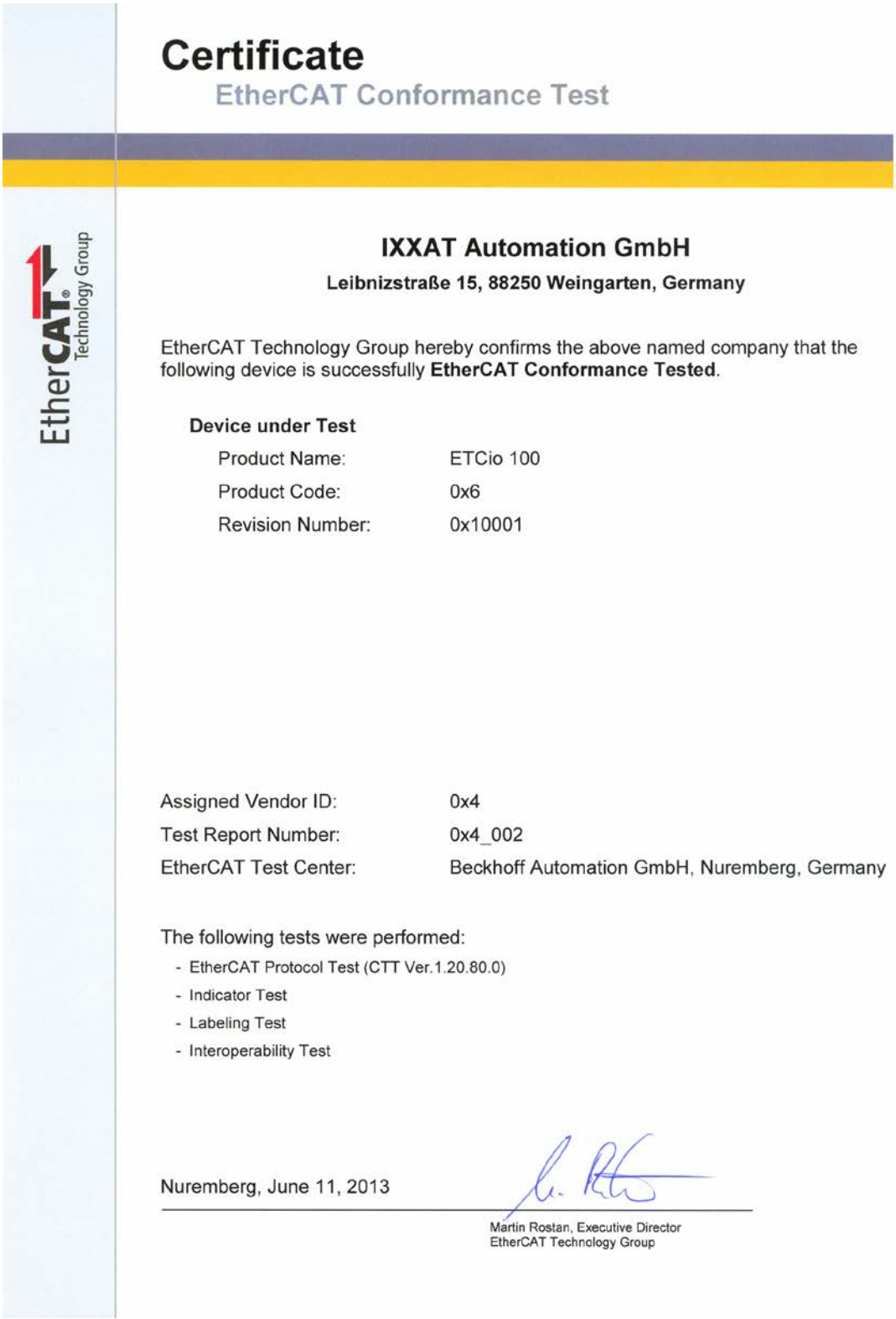
satisfies the requirements of EC Directive 2004/108/EC.

Applicable harmonized standards: EN 55022:2010
EN 61000-6-2:2005

17.12.2012, Dipl.-Ing. Christian Schlegel, Managing director

IXXAT Automation GmbH
Leibnizstr. 15
88250 Weingarten

6.7 EtherCAT Conformance Test Certificate



Certificate

EtherCAT Conformance Test

EtherCAT Technology Group

IXXAT Automation GmbH

Leibnizstraße 15, 88250 Weingarten, Germany

EtherCAT Technology Group hereby confirms the above named company that the following device is successfully **EtherCAT Conformance Tested**.

Device under Test

Product Name:	ETCio 100
Product Code:	0x6
Revision Number:	0x10001

Assigned Vendor ID:	0x4
Test Report Number:	0x4_002
EtherCAT Test Center:	Beckhoff Automation GmbH, Nuremberg, Germany

The following tests were performed:

- EtherCAT Protocol Test (CTT Ver.1.20.80.0)
- Indicator Test
- Labeling Test
- Interoperability Test

Nuremberg, June 11, 2013

Martin Rostan, Executive Director
EtherCAT Technology Group