OPERATION MANUAL

2511
EtherCAT Manual

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For your safety

The following symbols on the 2511 and in this operation manual warn of hazards.

1.1 Symbols used in the instruction manual

1.1.1 Signal words

The following signal words are used in the operation manual according to the specified hazard classification.

DANGER
High degree of risk: indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING
Moderate degree of risk: indicates a hazardous situation which, if not avoided, may result in death or serious injury.
CAUTION
Low degree of risk: indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE
Property damage to the equipment or the surroundings will result if the hazard is not avoided.

Note: It is important to heed these safety notices in order to ensure you handle the 2511 correctly.

IMPORTANT: Follow the information given in the operation manual.

1.1.2 Pictograms

Symbol	Description
	Warning concerning the use and installation of the device and software.
	Observe the advice for protecting the instrument.

1.2 Symbols and precautionary statements on the instrument

Symbol	Description
	Hazard warning Disconnect the power plug before opening – Follow safety instructions – Professional servicing only
Warning ! To prevent electrical shock do not open device.	**Warning of electrical shock hazard** Do not open the unit.
To prevent fire replace only with same type and rating of fuse !	**Warning of fire hazard** Always replace the fuse with a fuse of the same type and rating.

1.3 Abbreviations

Abbreviation	Description
BF	Bus error
ESI	EtherCAT Slave Information file

2 Trademarks and Patents

EtherCAT® is a registred trademark and patended technology of Beckhoff Automation GmbH, Germany

Patents:

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, DE102004044764, DE102007017835 with corresponding applications or registrations in various other countries.

3 Technical data

3.1 Supported EtherCAT-functions

- PDO – Process Data Objects
- SDO – Service Data Objects

You will find further information about EtherCAT at: https://www.ethercat.org/

3.2 Model 2511 device data

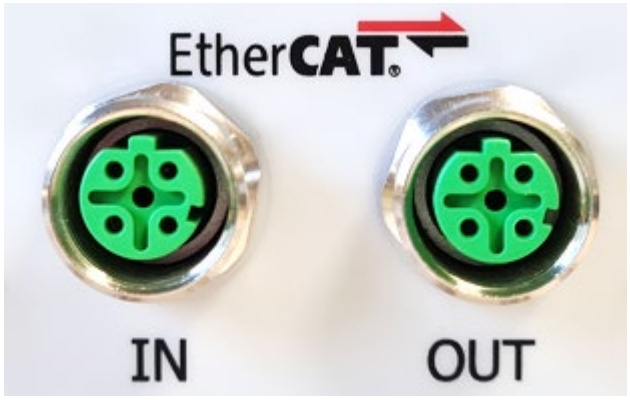
Bus connector	M12
ESI file	burster_2511.xml

4 Installation

Please note that you can download various documents such as installation guidelines and specifications about EtherCAT on https://www.ethercat.org/.

4.1 Port identification

The burster model 2511 EtherCAT can be integrated into the fieldbus network via 2x M12 Industrial Ethernet ports.



4.2 LED functions

4.2.1 Run LED (RUN)

The Run LED reflects the status of the EtherCAT device.

LED State	Indication	Description
Off	INIT	EtherCAT device in 'INIT'-state (or no power)
Green	OPERATIONAL	EtherCAT device in 'OPERATIONAL'-state
Green, blinking	PRE-OPERATIONAL	EtherCAT device in 'PRE-OPERATIONAL'-state
Green, single flash	SAFE-OPERATIONAL	EtherCAT device in 'SAFE-OPERATIONAL'-state
Flickering	BOOT	The EtherCAT device is in 'BOOT' state
Red	(Fatal Event)	If RUN and ERR turn red, this indicates a fatal event, forcing the bus interface to a physically passive state. Contact technical support.

Table 1: Run LED (RN)

4.2.2 Error LED (ER)

The Error LED indicates EtherCAT communication errors etc.

LED State	Indication	Description
Off	No error	No error (or no power)
Red, blinking	Invalid configuration	State change received from master is not possible due to invalid register or object settings.
Red, single flash	Unsolicited state change	Slave device application has changed the EtherCAT state autonomously.
Red, double flash	Sync Manager watchdog timeout	Master doesn't update the Read Process Data within the specified time period
Red	Application controller failure	Fieldbus module in EXCEPTION. If RUN and ERR turn red, this indicates a fatal event, forcing the bus interface to a physically passive state. Contact technical support.
Flickering	Booting error detected	E.g. due to firmware download failure.

Table 2: Error LED (ER)

4.2.3 Link/Activity LED (L/A)

The two Link/Activity LEDs indicate the EtherCAT link status and activity.

LED State	Indication	Description
Off	No Link	Link not sensed (or no power)
Green	Link sensed, no activity	Link sensed, no traffic detected
Green, flickering	Link sensed, activity	Link sensed, traffic detected

Table 3: LINK/Activity LED (L/A)

4.2.4 Meas LED

The Meas LED is a bi-coloured LED that indicates the module's basic status.

LED State	Description
Green, fast blinking	Boot-up
Green, slow blinking (~2 Hz)	Normal operation
Green, flickering	Link sensed, traffic detected
Red, Flash 3 times (repeat)	Fieldbus module error: Module not detected
Red, Flash 4 times (repeat)	Fieldbus module error: Module not supported
Red, Flash 5 times (repeat)	Fieldbus module error: Module not answering
Red, Flash 6 times (repeat)	Fieldbus module error: Module shutdown
Red, Flash 7 times (repeat)	Fieldbus module error: Unexpected error
Green, Red, Permanent	Analogue Input overflow

Table 4: Meas LED

4.2.5 OP LED

LED State	Description
Green, ON	Device is ready for a new measurement
Green, OFF	Device is **not** ready for a new measurement

Table 5: OP LED

5 EtherCAT

5.1 General information on ETHERCAT data transfer

The 2511 with EtherCAT uses for the data transfer the EtherCAT technology CoE (CANopen over EtherCAT). There are two types of data – data which are transferred with each cycle (PDO – Process Data Objects) and data which are transferred on demand only (SDO – Service Data Objects). The SDO-Data are addressed via a combination of Index and Instance Number which you will find in the tables below.

The 2511 device is controlled using the data transferred from Master to Slave. This data always consists of eight bytes for the 2511 unit.

The 2511 sends cyclic 88 bytes to Master. This packet contains device status information and newest measurement values for Rac, Rdc and Ucell.

Note: Decimal value 909090 will be sent if no valid value is available

5.2 Data conversion

5.2.1 Description of the data formats in this manual

The terms PLC inputs and PLC outputs refer to the 2511 unit. These terms are reversed when referring to the Master.

The floating-point numbers ("float" / “real”) mentioned are four bytes long (32 bits) and are based on the IEEE-754 standard.

Numbers that are not specifically labeled or are labeled with "d" or "dec" are decimal numbers, i.e. 1234, 1234dec, dec1234, 1234d.

Numbers labeled "0x" or "hex" are hexadecimal numbers, i.e. 0x1234, hex1234, 1234hex, 1234h.

Numbers labeled "b" or "bin" are binary numbers, i.e. b1100, bin1100, 1100b, 1100bin.

5.2.2 Handling problems that arise when reading floating-point numbers

This only concerns cases in which floating-point numbers need to be read from the 2511 unit.

Floating-point numbers (data type REAL), according to IEEE 754, are encoded as four bytes for transfer. This may create problems depending on the type of PLC used.

Cause

In the 2511-EtherCAT, the sign byte is transferred first if using acyclic data transfer and last during cyclic data transmission. Some PLCs expect this byte in the highest of the four addresses not in the lowest address. This inevitably leads to misinterpretation of the numeric value. In this case, the order of the four bytes has to be changed by the PLC as shown in the figure.

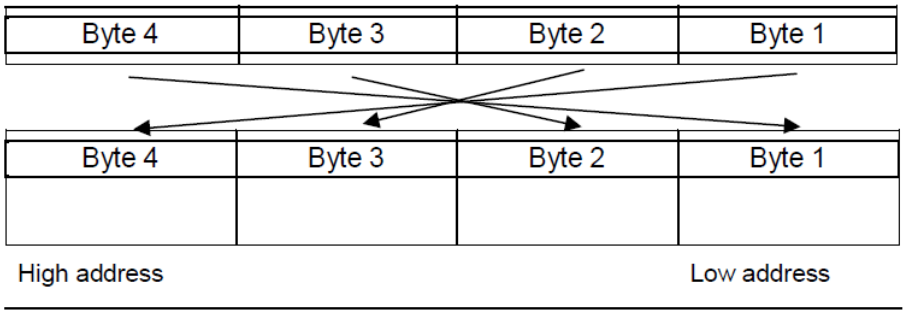


Diagram 1: Exchange of the order of bytes caused by misinterpretation of the numeric value

5.3 Illegal / not valid data

If the device has no valid measurement data to send, it will send the number “909090.0” instead as a default.
If no data was transmitted from the measurement unit to the control board after start-up yet, the measurement results will be initialized with “909089.0”
This value will be replaced with the real measurement value (or 909090.0 if not successful) after the first measurement.

6 EtherCAT data protocol

6.1 EtherCAT PDO (Process Data Objects) – Transfer from Master to Slave

Eight bytes of PLC-Out data for the 2511 are always transferred from the EtherCAT Master to the 2511.

Please Note: Bits marked as 'reserved' should remain at 0.

6.1.1 EtherCAT PDO bytes overview (Master → Slave)

Address-offset	Length (Bytes)	Description	
0	1	**CONTROL Byte A**	
		xxxx xxx1	Bit 0: Start measurement on configured channel (0->1 Edge triggered)
		xxxx xx1x	Bit 1: Reserved
		xxxx x1xx	Bit 2: Reserved
		xxxx 1xxx	Bit 3: Reserved
		xxx1 xxxx	Bit 4: Reserved
		xx1x xxxx	Bit 5: Reserved
		x1xx xxxx	Bit 6: Reserved
		1xxx xxxx	Bit 7: Reserved
1	1	**CONTROL Byte B**	
		xxxx xxx1	Bit 0: Reserved
		xxxx xx1x	Bit 1: Reserved
		xxxx x1xx	Bit 2: Reserved
		xxxx 1xxx	Bit 3: Reserved
		xxx1 xxxx	Bit 4: Reserved
		xx1x xxxx	Bit 5: Reserved
		x1xx xxxx	Bit 6: 0: "Set Operating Mode NumParam/Speed/Freq in cyclic communication" disabled 1: "Set Operating Mode NumParam/Speed/Freq in cyclic communication" enabled
		1xxx xxxx	Bit 7: Reserved 0: "Set Operating Mode InpRange in cyclic communication" disabled 1: "Set Operating Mode InpRange in cyclic communication" enabled
2	1	Operating Mode: Number of Parameters/Speed/Frequency (see Index 24) **Only valid, if enabled with CONTROLBYTE B bit 6 (above AdrOffset 1 bit 6)** "0": 3-parameter-measurement, standard speed (f1 = 1 kHz, f2 = 1 Hz) "1": 3-parameter-measurement, standard speed (f1 = 1 kHz, f2 = 10 Hz) "2": 3-parameter-measurement, standard speed (f1 = 1 kHz, f2 = 100 Hz) "3": 2-parameter-measurement, standard speed (f1 = 1 kHz) "4": 3-parameter-measurement, fast speed (f1 = 1 kHz, f2 = 100 Hz) "5": 2-parameter-measurement, fast speed (f1 = 1 kHz) "6": 3-parameter-measurement, slow speed (f1 = 1 kHz, f2 = 1 Hz) "7": 3-parameter-measurement, slow speed (f1 = 1 kHz, f2 = 10 Hz)	
3	1	Operating Mode: Input Range (see Index 25) **Only valid, if enabled with CONTROLBYTE B bit 7 (above AdrOffset 1 bit 7)** "0": 10 mΩ "1": 30 mΩ "2": 100 mΩ "3": 300 mΩ	
4	2	Reserved	

6	2	Reserved

Table 6: PLC output bytes overview

6.2 EtherCAT PDO (Process Data Objects) – Transfer from Slave to Master

The following data refers to the PLC input from the 2511, transferred from the 2511 to the EtherCAT Master.

6.2.1 PDO bytes overview (Slave → Master)

Address-offset	Length (Bytes)	Description	
0	1	**READY Status**	
		xxxx xxx1	Bit 0: Ready-bit
		xxxx xx1x	Bit 1: Reserved
		xxxx x1xx	Bit 2: Reserved
		xxxx 1xxx	Bit 3: Reserved
		xxx1 xxxx	Bit 4: Reserved
		xx1x xxxx	Bit 5: Reserved
		x1xx xxxx	Bit 6: Reserved
		1xxx xxxx	Bit 7: Ready-Mode activated
1	**1**	**Device Status**	
		xxxx xxx1	Bit 0:Illegal Attempt “Measurement Start without Ready” detected Flag is reset with next valid measurement start
		xxxx xx1x	Bit 1: Reserved
		xxxx x1xx	Bit 2: Reserved
		xxxx 1xxx	Bit 3: Reserved
		xxx1 xxxx	Bit 4: Reserved
		xx1x xxxx	Bit 5: Reserved
		x1xx xxxx	Bit 6: Reserved
		1xxx xxxx	Bit 7: Reserved
Measurement Channel 1			
2	1	Live Counter	See 6.2.2 Device Measurement Channel explanation
3	1	Error Code	
4	1	Limit Check Result	
5	1	Reserved	
6	4	R_{AC}	
10	4	R_{DC}	
14	4	U_{CELL}	
Measurement Channel 2			
18	1	Live Counter	See 6.2.2 Device Measurement Channel explanation
19	1	Error Code	
20	1	Limit Check Result	
21	1	Reserved	
22	4	R_{AC}	
26	4	R_{DC}	
30	4	U_{CELL}	
Measurement Channel 3			
34	1	Live Counter	See 6.2.2 Device Measurement Channel explanation
35	1	Error Code	
36	1	Limit Check Result	
37	1	Reserved	
38	4	R_{AC}	
42	4	R_{DC}	
46	4	U_{CELL}	
Measurement Channel 4			
50	1	Live Counter	See 6.2.2 Device Measurement Channel explanation
51	1	Error Code	
52	1	Limit Check Result	

53	1	Reserved			
54	4	R_{AC}			
58	4	R_{DC}			
62	4	U_{CELL}			
Measurement Channel 5					
66	1	Live Counter			See 6.2.2 Device Measurement Channel explanation
67	1	Error Code			
68	1	Limit Check Result			
69	1	Reserved			
70	4	R_{AC}			
74	4	R_{DC}			
78	4	U_{CELL}			
82	4	Measured Temperature (real)			
86	1	Temperature Live Counter, incremented with each temperature measurement			
87	1	Operating Mode Mirror			
		xxxx xxxR	Range	0000: 10 mΩ	
		xxxx xxRx		0001: 30 mΩ	
		xxxx xRxx		0010: 100 mΩ	
		xxxx Rxxx		0011: 300 mΩ	
		xxxM xxxx	Mode	0000: Mode 0	See 6.1.1 offset 2
		xxMx xxxx		0001: Mode 1	
		xMxx xxxx		0010: Mode 2	
		Mxxx xxxx		0011: Mode 3	
				0100: Mode 4	
				0101: Mode 5	
				0110: Mode 6	
				0111: Mode 7	

Table 7: PLC input bytes overview

6.2.2 Device Measurement Channel explanation

The 2511 has five measurement channels, each containing 16 bytes of data with following structure:

Address-offset	Length (Bytes)	Description	
0	1	**Live Counter** Incremented with each new measurement (RAC, RDC, U). This counter is used to check if a new measurement has been made and can further reveal if one or multiple measurement values have been missed. The counter overflows from 255 to 0, before counting up again.	
1	1	Error Code (bit coded)	
		xxxx xxx1	Bit 0: U Range exceeded
		xxxx xx1x	Bit 1: Impedance Range exceeded
		xxxx x1xx	Bit 2: Contact Error SENSE
		xxxx 1xxx	Bit 3: Contact Error FORCE
		xxx1 xxxx	Bit 4: Internal Checksum Error
		xx1x xxxx	Bit 5: Cross Switch Contact Error: Force
		x1xx xxxx	Bit 6: Cross Switch Contact Error: Sense
		1xxx xxxx	Bit 7: Cross Switch Error Polarity Sense
2	1	**Limit Check Result (bit coded)**	
		xxxx xxx1	Bit 0: Measurement Value of RAC under lower limit
		xxxx xx1x	Bit 1: Measurement Value of RAC over upper limit
		xxxx x1xx	Bit 2: Measurement Value of RDC under lower limit
		xxxx 1xxx	Bit 3: Measurement Value of RDC over upper limit
		xxx1 xxxx	Bit 4: Measurement Value of UCELL under lower limit
		xx1x xxxx	Bit 5: Measurement Value of UCELL over upper limit

		x1xx xxxx	Bit 6: Reserved
		1xxx xxxx	Bit 7: Reserved
3	1	Reserved	
4	4	Newest measurement value: Resistance AC, RAC (real)	
8	4	Newest measurement value: Resistance DC, RDC (real)	
12	4	Newest measurement value: Cell Voltage, UCELL (real)	

Table 8: Device measurement channel explanation

7 EtherCAT SDO – Service Data Objects

Note: The service data objects (SDO) are described from the master's point of view.

Note: Note: The instance number must always be set to 0.

Note: If your perform a write operation it is recommended to read the written value back to be sure that the parameter was correctly set by device

The acyclic EtherCAT services allow access to the following 2511 functions:

- Complete device configuration
- Transfer of order sheet data for logging
- Retrieval of analytical data

For further information and support for Siemens PLC integration, please contact our service department at service@burster.com.

The following abbreviations are used below:

WO	Write Only
RO	Read Only
RW	Read and Write
BOOL	Data type Boolean
REAL	Data type Real, Length = 4 Byte
STR*n*	Data type String, String of *n* Bytes
U8	Data type Unsigned 8, Length = 1 Byte
U16	Data type Unsigned 16, Length = 2 Byte
U32	Data type Unsigned 32, Length = 4 Byte

7.1 Device Info

Index (hex)	Type	Size (Bytes)	Access	Entry
0x23F2	STR20	20	RO	Device Type
0x23F3	STR20	20	RO	Serial Number digital board
0x23F4	STR20	20	RO	Calibration Date digital board
0x23F5	UINT16	2	RO	Calibration counter digital board
0x23F6	STR20	20	RO	Software Version Digital Board
0x23F7	STR20	20	RO	Serial Number Analog Board
0x23F8	STR20	20	RO	Board Type Analog Board
0x23F9	STR20	20	RO	Software Version Analog Board
0x23FA	STR20	20	RO	Flash Version Analog Board
0x23FB	STR20	20	RO	DIGI Hardware information string. Like DIGI?-command, parameters are separated with "_"

Table 9: Device Info (Index 10-19)

7.2 Measurement Setup

Index (hex)	Type	Size (Bytes)	Access	Entry
0x23FC	STR16	1	RW	RTC Setup: Timestamp Format: "YYYYMMDD_HHMMSS"
0x23FD	UINT8	1	RO	Available Channels for Measurement (bit coded)
0x23FE	UINT8	1	RW	Selected Channels for Measurement (bit coded)
0x23FF	UINT8	1	RW	reserved

0x2400	UINT8	1	RW	Operating Mode: Number of Parameters / Speed / Frequency “0”: 3-parameter-measurement, standard speed (f1 = 1 kHz, f2 = 1 Hz) “1”: 3-parameter-measurement, standard speed (f1 = 1 kHz, f2 = 10 Hz) “2”: 3-parameter-measurement, standard speed (f1 = 1 kHz, f2 = 100 Hz) “3”: 2-parameter-measurement, standard speed (f1 = 1 kHz) “4”: 3-parameter-measurement, fast speed (f1 = 1 kHz, f2 = 100 Hz) “5”: 2-parameter-measurement, fast speed (f1 = 1 kHz) “6”: 3-parameter-measurement, slow speed (f1 = 1 kHz, f2 = 1 Hz) “7”: 3-parameter-measurement, slow speed (f1 = 1 kHz, f2 = 10 Hz)
0x2401	UINT8	1	RW	Operating Mode: Measurement Input Range “0”: 10mΩ “1”: 30mΩ “2”: 100mΩ “3”: 300mΩ
0x2402	UINT8	1	RO	Setup change counter (0 … 255) increments with every setup change
0x2403	UINT16	2	WO	Reset all User Settings to default values! write password 62830 (2xPi)
0x2404	UINT8	1	RW	Readymode 0x0: inactive // 0x01: active See RDYM command in interface manual
0x2405	UINT8	1	RW	Ready-State Only relevant with activated Readymode See REDY command in interface manual
0x25DC	UINT8	1	RW	Password Protection for Display Menu Enable “0”: Disabled “1”: Enabled
0x2578	UINT16	2	RW	Current Password “0000” … “9999”
0x25DE	UINT8	1	RW	Display Brightness “0”… “5”
0x25DF	UINT8	1	RW	User Language “0”: Deutsch “1”: English “2”: Francais “3”: Espanol “4”: Italiano

Table 10: Measurement Setup (Index 20-29)

7.3 Limits

Index (hex)	Type	Size (Bytes)	Access	Entry
Measurement Channel 1				
0x2406	UINT8	1	RW	Enable Limit R_{DC} 0x00: Disabled, 0x01: Enabled
0x2407	UINT8	1	RW	Enable Limit R_{AC} 0x00: Disabled, 0x01: Enabled
0x2408	UINT8	1	RW	Enable Limit U_{CELL} 0x00: Disabled, 0x01: Enabled
0x2409	REAL	4	RW	Lower Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x240A	REAL	4	RW	Upper Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x240B	REAL	4	RW	Lower Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x240C	REAL	4	RW	Upper Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x240D	REAL	4	RW	Lower Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
0x240E	REAL	4	RW	Upper Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
Measurement Channel 2				

0x2410	UINT8	1	RW	Enable Limit R_{DC} 0x00: Disabled, 0x01: Enabled
0x2411	UINT8	1	RW	Enable Limit R_{AC} 0x00: Disabled, 0x01: Enabled
0x2412	UINT8	1	RW	Enable Limit U_{CELL} 0x00: Disabled, 0x01: Enabled
0x2413	REAL	4	RW	Lower Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2414	REAL	4	RW	Upper Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2415	REAL	4	RW	Lower Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2416	REAL	4	RW	Upper Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2417	REAL	4	RW	Lower Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
0x2418	REAL	4	RW	Upper Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
Measurement Channel 3				
0x241A	UINT8	1	RW	Enable Limit R_{DC} 0x00: Disabled, 0x01: Enabled
0x241B	UINT8	1	RW	Enable Limit R_{AC} 0x00: Disabled, 0x01: Enabled
0x241C	UINT8	1	RW	Enable Limit U_{CELL} 0x00: Disabled, 0x01: Enabled
0x241D	REAL	4	RW	Lower Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x241E	REAL	4	RW	Upper Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x241F	REAL	4	RW	Lower Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2420	REAL	4	RW	Upper Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2421	REAL	4	RW	Lower Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
0x2422	REAL	4	RW	Upper Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
Measurement Channel 4				
0x2424	UINT8	1	RW	Enable Limit R_{DC} 0x00: Disabled, 0x01: Enabled
0x2425	UINT8	1	RW	Enable Limit R_{AC} 0x00: Disabled, 0x01: Enabled
0x2426	UINT8	1	RW	Enable Limit U_{CELL} 0x00: Disabled, 0x01: Enabled
0x2427	REAL	4	RW	Lower Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2428	REAL	4	RW	Upper Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2429	REAL	4	RW	Lower Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x242A	REAL	4	RW	Upper Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x242B	REAL	4	RW	Lower Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
0x242C	REAL	4	RW	Upper Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
Measurement Channel 5				
0x242E	UINT8	1	RW	Enable Limit R_{DC} 0x00: Disabled, 0x01: Enabled
0x242F	UINT8	1	RW	Enable Limit R_{AC} 0x00: Disabled, 0x01: Enabled
0x2430	UINT8	1	RW	Enable Limit U_{CELL}

				0x00: Disabled, 0x01: Enabled
0x2431	REAL	4	RW	Lower Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2432	REAL	4	RW	Upper Limit R_{DC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2433	REAL	4	RW	Lower Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2434	REAL	4	RW	Upper Limit R_{AC} in [mΩ] Please make sure: Upper>Lower, Upper ≠ Lower
0x2435	REAL	4	RW	Lower Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower
0x2436	REAL	4	RW	Upper Limit U_{CELL} in [V] Please make sure: Upper>Lower, Upper ≠ Lower

Table 11: Limits (Index 30-78)

7.4 Temperature Measurement Setup

Note: Only available with Pyrometer option.

Index (hex)	Type	Size (Bytes)	Access	Entry
0x25DD	UINT8	1	RW	Temperature Measurement Enable "0": Disabled "1": Enabled
0x2438	U8	1	RO	Pyrometer function available 0x00: no // 0x01: yes
0x2439	REAL	4	RW	Pyrometer calibration value low in [V]
0x243A	REAL	4	RW	Pyrometer calibration value high in [V]
0x243B	REAL	4	RW	Pyrometer scale value low in [°C]
0x243C	REAL	4	RW	Pyrometer scale value high in [°C]
0x243D	U8	1	WO	Calculate pyrometer calibration Requires prior valid entries written to Indices 81-84

Table 12: Temperature Measurement Setup (Index 80-85)

7.5 Temperature Measurement Values

Index (hex)	Type	Size (Bytes)	Access	Entry
0x2442	REAL	4	RO	Current temperature measurement value
0x2443	U8	1	RO	Temperature measurement Toggle Counter

Table 13: Measurement Values (Index 90-91)

7.6 Data Container

Index (hex)	Type	Size (Bytes)	Access	Entry
0x244C	STR50	50	RW	Device Name Zero terminated String, String length has to be 50 Bytes exactly
0x244D	STR50	50	RW	Device Comment Zero terminated String, String length has to be 50 Bytes exactly

Table 14: Data Container (Index 100-101)

Index 102-126

IMPORTANT: The index range 102-126 is occupied. Further information is only relevant for internal use.

7.7 Order Sheet

Index (Decimal)	Type	Size (Bytes)	Access	Description
0x246A	STR20	20	RW	Station name

0x246B	STR64	64	RW	Worker name
0x246C	STR64	64	RW	Order number
0x246D	STR64	64	RW	Batch number
0x246E	STR64	64	RW	Part Name
0x246F	STR64	64	RW	Part Serial Number 1 Channel 1
0x2470	STR64	64	RW	Part Serial Number 2 Channel 1
0x2471	STR64	64	RW	Part Serial Number 1 Channel 2
0x2472	STR64	64	RW	Part Serial Number 2 Channel 2
0x2473	STR64	64	RW	Part Serial Number 1 Channel 3
0x2474	STR64	64	RW	Part Serial Number 2 Channel 3
0x2475	STR64	64	RW	Part Serial Number 1 Channel 4
0x2476	STR64	64	RW	Part Serial Number 2 Channel 4
0x2477	STR64	64	RW	Part Serial Number 1 Channel 5
0x2478	STR64	64	RW	Part Serial Number 2 Channel 5
0x2479	U8	1	RW	Reserved – Do not use
0x247A	STR64	64	RW	Reserved – Do not use
0x247B	STR64	64	RW	Reserved – Do not use
0x247C	STR64	64	RW	Reserved – Do not use
0x247D	STR64	64	RW	Reserved – Do not use
0x247E	STR64	64	RW	Reserved – Do not use
0x247F	STR64	64	RW	Reserved – Do not use
0x2480	U8	1	WO	Reset Shift Counter • write any byte to reset all counters
0x2481	U32	4	RO	Read combined Measurement Counter of all Channels
0x2482	U32	4	RO	Read Measurement Counter of Channel 1 (counts measurements only of channel 1)
0x2483	U32	4	RO	Read Measurement Counter of Channel 2 (counts measurements only of channel 2)
0x2484	U32	4	RO	Read Measurement Counter of Channel 3 (counts measurements only of channel 3)
0x2485	U32	4	RO	Read Measurement Counter of Channel 4 (counts measurements only of channel 4)
0x2486	U32	4	RO	Read Measurement Counter of Channel 5 (counts measurements only of channel 5)
0x2487	U32	4	RO	Read combined NOK Counter of all Channels
0x2488	U32	4	RO	Read NOK Counter of Channel 1 (counts only NOKs of channel 1)
0x2489	U32	4	RO	Read NOK Counter of Channel 2 (counts only NOKs of channel 2)
0x248A	U32	4	RO	Read NOK Counter of Channel 3 (counts only NOKs of channel 3)
0x248B	U32	4	RO	Read NOK Counter of Channel 4 (counts only NOKs of channel 4)
0x248C	U32	4	RO	Read NOK Counter of Channel 5 (counts only NOKs of channel 5)

Table 15: Order Sheet (Index 130-164)

7.8 Reserved for future use

Index (hex)	Type	Size (Bytes)	Access	Entry
0x24B0	REAL	4	RW	Reserved float number 1
…	….	….	….	….
0x2513	REAL	4	RW	Reserved float number 100
0x2514	U32	4	RW	Reserved integer number 1
…	….	….	….	….
0x2577	U32	4	RW	Reserved integer number 100
0x2579	U16	2	RW	Reserved short number 2 (1 element is already used)
…	….	….	….	….
0x25DB	U16	2	RW	Reserved short number 100
0x25E0	U8	1	RW	Reserved byte number 5 (4 bytes are already used)
…	….	….	….	….
0x263F	U8	1	RW	Reserved byte number 100

Table 16: Reserved for future use (Index 200-324)

7.9 Error Codes

The following error codes are of a EtherCAT Master in response to EtherCAT communication with the 2511.

Error number	Description
0xC0650031 or 0x06020000	**Object does not exist in the object dictionary**
0xC065003A or 0x06090011	**Subindex does not exist (read access)**
0xC0CF8013 or 0x06090011	**Subindex does not exist (write access)**
0xC0CF8006 or 0x06010002	**Object is read-only and cannot be written**
0xC0CF8010 or 0x06070012	**Data type does not match**
0xC0CF8011 or 0x06070012	**Data length is too long**
0xC0CF8012 or 0x06070013	**Data length is too short**
0xC0650028	**Timeout**
0xC065002F or 0x06010001	**Object is write-only and cannot be read**
0x06090030	**Value out of range (only for write access)**
0x08000022	**Invalid present device state**
0x05040005	**Out of memory**
0x06090031	**Value too high**
0x06090032	**Value too low**
0x08000021	**Protected access**
0x08000000	**General error**
0xC0650035	**General internal incompatibility error**

Table 17: Error Codes