Power Supplies with EtherCAT Interface

This document gives access to details of data structures and their communication with EtherCAT interfaces built into the following PULS power supplies of the DIMENSION series:

- CP10.241-ETC, 24V, 10A, 240W
- CP20.241-ETC, 24V, 20A, 480W
- CP20.481-ETC, 48V, 10A, 480W

These interfaces come with an ESI-EEPROM which contains the EtherCAT identity with the revision number.
The EtherCAT slave information, also colloquially known as the ESI/XML configuration file for the EtherCAT master, is stored on it.

Index

Terminology and Abreviations

PE and ⏚ symbol	PE is the abbreviation for **P**rotective **E**arth and has the same meaning as the symbol ⏚.
Earth, Ground	This document uses the term “earth” which is the same as the U.S. term “ground”.
t.b.d.	To be defined, value or description will follow later.
AC 230 V	A figure displayed with the AC or DC before the value represents a nominal voltage with standard tolerances (usually ±15 %) included. E.g.: DC 12 V describes a 12 V battery disregarding whether it is full (13.7 V) or flat (10 V)
230 Vac	A figure with the unit (Vac) at the end is a momentary figure without any additional tolerances included.
50 Hz vs. 60 Hz	As long as not otherwise stated, AC 230 V parameters are valid at 50 Hz mains frequency.
may	A key word indicating flexibility of choice with no implied preference.
shall	A key word indicating a mandatory requirement.
should	A key word indicating flexibility of choice with a strongly preferred implementation.
⇨	Action step
✓	Positive result
×	Negative result
CoE	**C**AN **o**ver **E**thernet
DUT	**D**ata **U**nit **T**ypes (user-specific data types)
PDO	**P**rocess **D**ata **O**bjects
FoE	**F**ile **A**ccess **o**ver **E**therCAT
OP	**Op**erational / Normal Mode
ADS	**A**utomation **D**evice **S**pecification
PLC	**P**rogrammable **L**ogic **C**ontroller

1. Switching output via EtherCAT

Switching the outputs when the system is at a standstill or in the event of an error via "Disable output"

The output voltage of the device can be disabled via "Disable output". In the event of a system standstill or fault, the power supply and corresponding downstream system components can be switched off and on again via TwinCAT in a targeted and location-independent manner.

1. Enable the PDO 0x1600 "PSU Outputs" via the "Process data" tab.
   ⇨ "Disable output" is displayed in the tree structure.
   The power supply output can be disabled via the "Disable output" bit.
2. Restarting the EtherCAT system or reloading the configuration in Config mode (F4) restarts the EtherCAT communication and the process data is transferred.
3. If the "Disable output" bit is set to TRUE, the DC output voltage of the device is switched off.
   ⇨ The output remains disabled as long as "Disable output" = TRUE.
   ⇨ The voltage at the output returns when the "Disable output" bit is disabled again.

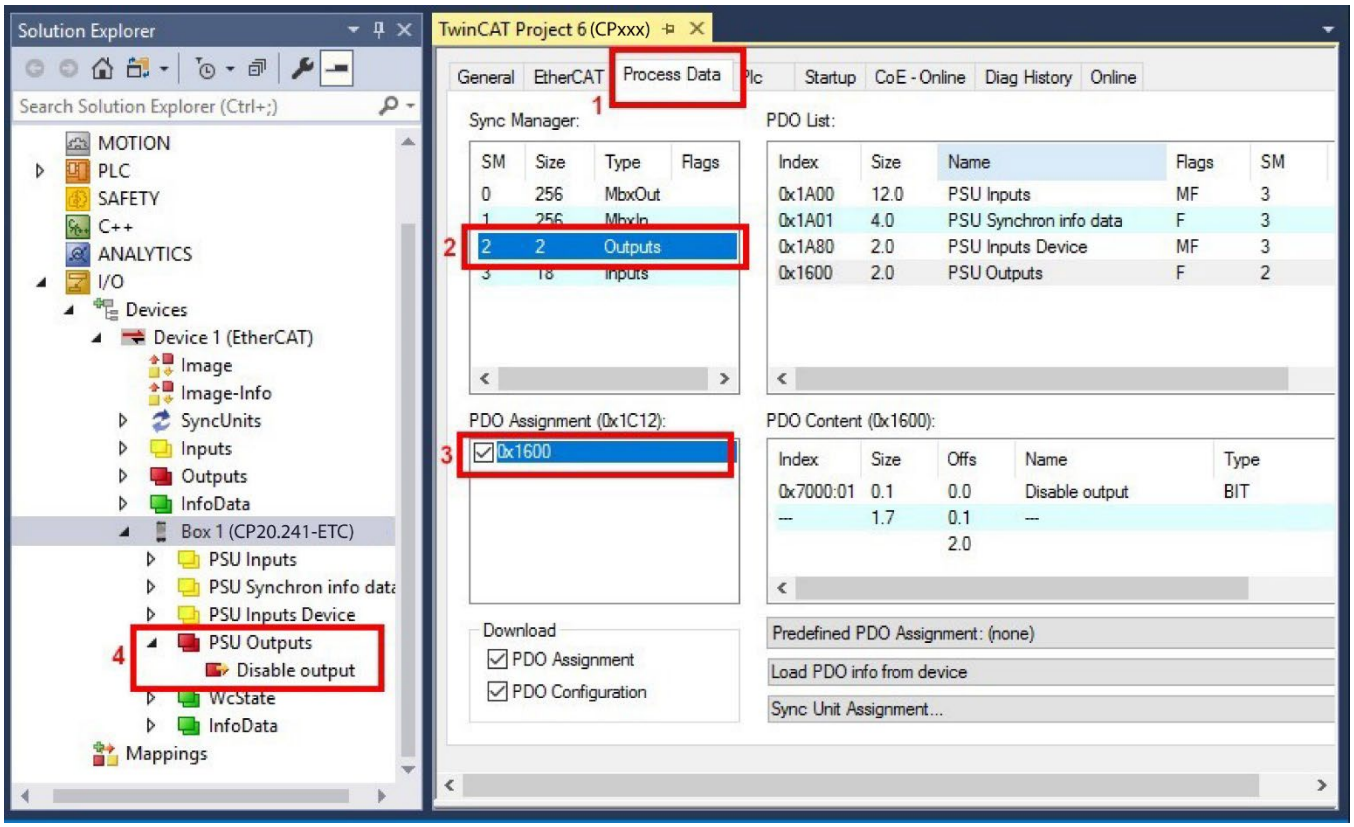


Fig. 1-1 Enabling "Disable Output" via the Process Data tab using the CP20.241-ETC as an example

2. Start-up behaviour of the output voltage

Change the behaviour of the output voltage at startup via index 0x8001:41 "Default Start Up Output State"

- This function only takes effect if the device is completely de-energised on both the primary and secondary sides and the internal capacitors are discharged.
- If the input voltage is only interrupted for a short time, this function does not take effect. Due to the internal capacitance, the internal auxiliary voltage can remain on for several seconds, depending on the load situation. The EtherCAT interface can also continue to communicate actively during this time. If the input voltage returns during this time without a loss of communication, the last known state of the output is retained.

When delivered, the device is parameterized so that the output voltage is applied directly when the input voltage is switched on.

1. Behaviour at start (see fig. 2-1 “AC Power on”)
   - The behaviour of the output voltage at startup can be changed via the CoE object 0x8001:41 ("Default Start Up Output State").
   - 0x8001:41 = 0 "Enable Output” (Default)
   - 0x8001:41 = 1 "Disable Output"
     If the bit is set to "Disable Output", the output voltage is not switched on directly after switching on.
2. Behaviour after reaching the OP state (see Fig. 2-1 “Stage change to OP”).
   As soon as the EtherCAT devices state changes to OP, this setting becomes ineffective and is taken over by the process data bit "Disable output" (0x1600:01).
   - This is not mapped in the standard configuration, which means that the device switches on the output voltage after reaching the OP state.
   - If the device is not to switch on the voltage even after reaching the OP state, the "Disable output" PDO (0x1600:01) must be mapped and must be set to "TRUE" before reaching the OP state.

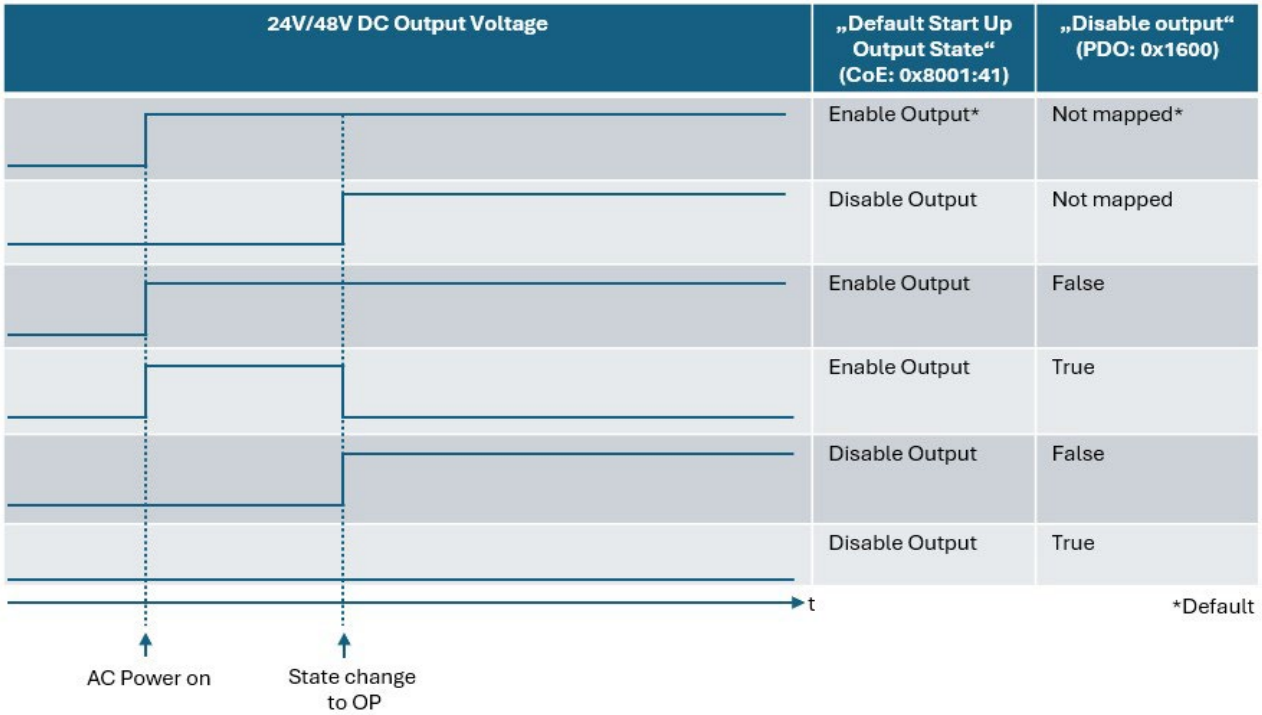


Fig. 2-1: Start-up behaviour dependent on CoE 0x8001:41 and 0x1600

3. Information on grid monitoring on the input side

Using the measurement data recorded on the input side in object 0xFA14 it is possible to monitor the mains voltage over a longer period of time. Creeping changes and quality problems can thus be detected at an early stage and prevented with suitable measures before they become a problem for the power supply or other connected devices.

RMS input voltage

The AC input voltage is determined with an effective power measurement. In the nominal voltage range of 85 - 264 Vac, an average value is calculated over 10 mains periods.

Undervoltages and overvoltages

A supply voltage that is too low or too high at the input can be detected using the CPxxx-ETC power supplies.

The devices themselves are largely protected against voltage fluctuations within the nominal voltage range, as the wide-range input 100 - 240 Vac (-15%, +10%) in the device ensures that the 24 Vdc (CPxx.241-ETC) / 48 Vdc (CPxx.481-ETC) output remains stable even in the event of major deviations in the supply voltage.

The undervoltage range begins when the voltage falls below 75 Vac and is exited again when it exceeds 85 Vac. A hysteresis of 10 Vac is stored here. There are two measuring principles within the undervoltage range:

- from 0 - 65 Vac: effective power measurement over ½ mains period
- from 65 - 75 Vac: effective power measurement over 1 mains period

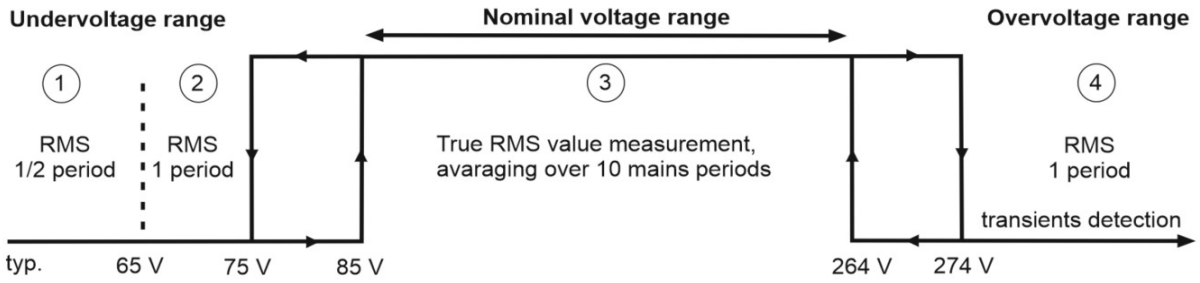
The overvoltage range begins when 274 Vac is exceeded and is exited again when the value falls below 264 Vac. A hysteresis of 10 Vac is stored here.

Peak voltages are measured up to a level of 700 V.

Rapid overvoltages and transients

Rapid overvoltages and transients are also detected by the CPxxx-ETC power supplies. For example, the VDE-0160 pulse and surge pulses from 750 V are detected.

Measuring times of the effective power measurement as a function of the input voltage



Input voltage range			Measuring principle:
Undervoltage	1	< 65 Vac	Effective power measurement over ½ mains period
	2	65 - 75 Vac	Effective power measurement over 1 mains period
Nominal voltage	3	85 - 264 Vac	Effective power measurement, averaging over 10 mains periods
Overvoltage	4	< 274 Vac	Effective power measurement over 1 mains period, transient detection

Device-specific transmission times of typically 3 ms and the set cycle time are added to the measuring times.

4. Object description and parameterization

The CoE overview contains objects for different intended applications:

- Objects required for parameterization during commissioning:
  - Restore Object Index 0x1011, (see chapter 4.1)
  - Configuration data index 0x80n0, (see chapter 4.4)
- Objects intended for regular operation, e.g. through ADS access
- Profile-specific objects:
  - Configuration data (vendor-specific) index 0x80nF, (see chapter 4.6)
  - Input data Index 0x60n0, (see chapter 4.2)
  - Information and diagnostic data, (see chapter 4.7) Index 0xF000, 0xF008, 0xA000, 0xF914, 0xFA14

4.1. Restore object

Index (hex)	Name	Meaning	Data type	Flags	Default
1011:0	Restore default parameters (see chapter 5.1)	Restore default parameters	UINT8	RO	0x01 (1_{dec})
1011:01	SubIndex 001	If this object is set to "**0x64616F6C**" in the set value dialog, all backup objects are reset to their delivery state.	UINT32	RW	0x00000000 (0_{dec})

4.2. Input data

Index 6000 PSU Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	PSU Inputs		UINT8	RO	0x16 (22_{dec})
6000:01	Warning	Is set if one of the following conditions applies: • The output voltage (0x6000:11) falls below the DC OK threshold (0x8000:16) • The output voltage (0x6000:11) exceeds the overvoltage threshold (0x8000:14) • The output current (0x6000:12) exceeds the overcurrent threshold (0x8000:15) • The internal device temperature (0xFA14:1B) exceeds the internal temperature threshold (0xF814:11) • The input voltage "Actual RMS input voltage" (0xFA14:19) falls below the minimum value of the nominal input voltage • The device has been disconnected from the power supply • If the warning bit = 1, the cause of the warning can be viewed in the Diag History or via the TwinCAT EventLogger (see chapter 5.2)	BOOLEAN	RO	0x00 (0_{dec})
6000:02	Error	Becomes TRUE and results in the output voltage being switched off if one of the following conditions applies: • Device-specific overvoltage protection active. The output voltage has exceeded the maximum permissible value (see CPxxx-ETC datasheets chapter “Safety and Protection Features”). • Device-specific overcurrent protection active. The device was switched off due to the hiccup mode The error bit is an image of the on/off behavior of the hiccup mode (see CPxxx-ETC datasheets chapter “Output”). • Device-specific overtemperature protection active. The internal device temperature has exceeded the maximum permissible value (130°C). • If the error bit = 1, the cause of the error can be viewed in the Diag History or via the TwinCAT EventLogger (see chapter 5.2).	BOOLEAN	RO	0x00 (0_{dec})
6000:04	DC OK	The output voltage (0x6000:11) falls below the DC OK threshold (0x8000:16)	BOOLEAN	RO	0x00 (0_{dec})
6000:11	Output voltage	Current output voltage in V Accuracy: typ. ±0.2% FSV (full scale value, typ. 0 to 65 V)	REAL32	RO	0x00000000 (0_{dec})
6000:12	Output current	Current output current in A Accuracy: typ. ±0.2% FSV (full scale value, typ. 0 to 65 A)	REAL32	RO	0x00000000 (0_{dec})
6000:15	Info data 1	Synchronous information (selection via subindex 0x8001:19)	UINT16	RO	0x0000 (0_{dec})
6000:16	Info data 2	Synchronous information (selection via subindex 0x8001:21)	UINT16	RO	0x0000 (0_{dec})

Index F614 PSU Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
F614:0	PSU Inputs		UINT8	RO	0x03 (3_{dec})
F614:03	Input undervoltage	The input voltage "Actual RMS input voltage" (0xFA14:19) falls below the minimum value of the nominal input voltage.	BOOLEAN	RO	0x00 (0_{dec})

4.3. Output data

Index 7000 PSU Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	PSU Outputs		UINT8	RO	0x10 (16_{dec})
7000:01	Disable output	Switch off output voltage	BOOLEAN	RO	0x00 (0_{dec})

4.4. Configuration data

Index 8000 PSU Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	PSU Settings		UINT8	RO	0x16 (22_{dec})
8000:14	Overvoltage warn threshold	Adjustable overvoltage warning threshold (see chapter 5.3)	REAL32	RW	
		CP10.241-ETC from 0.0 V to 30.0 V			0x41E66666 (1105618534_{dec})
		CP20.241-ETC from 0.0 V to 30.0 V			0x41E66666 (1105618534_{dec})
		CP20.481-ETC from 0.0 V to 60.0 V			0x41400000 (1094713344_{dec})
		Default value: 1.2 * Nominal Voltage (0x800F:15 (See chapter 4.5) Hysteresis: 0.5 V If the output voltage (0x6000:11 (see chapter 4.2) exceeds this value, the warning bit (0x6000:01) is set in the input process data.			
8000:15	Overcurrent warn threshold	Adjustable overcurrent warning threshold (see chapter 5.3) from 0.0 A to 4 * Nominal current (0x800F:16).	REAL32	RW	
		CP10.241-ETC			0x41400000 (1094713344_{dec})
		CP20.241-ETC			0x41C00000 (1103101952_{dec})
		CP20.481-ETC			0x41400000 (1094713344_{dec})
		Default value: 1.2 * Nominal Current (0x800F:16) Hysteresis: 0.5 A If the output current (0x6000:12) exceeds this value, the warning bit (0x6000:01) is set in the input process data.			
8000:16	DC OK threshold	Adjustable DC OK threshold (see CPxxx-ETC datasheets chapter "DC OK Function")	REAL32	RW	
		CP10.241-ETC from 3.0 V to 30.0 V			0x41B00000 (1102053376_{dec})
		CP20.241-ETC from 3.0 V to 30.0 V			0x41B00000 (1102053376_{dec})
		CP20.481-ETC from 3.0 V to 60.0 V			0x42300000 (1110441984_{dec})
		Default value: 0.917 * Nominal Voltage (0x800F:15) Hysteresis: 0.5 V If the output voltage (0x6000:11) falls below this value, the warning bit (0x6000:01) is set in the input process data			

Index 8001 PSU Features

Index (hex)	Name	Meaning	Data type	Flags	Default
8001:0	PSU Features		UINT8	RO	0x21 (33_{dec})
8001:01	Parallel use	Must be set if several power supplies are connected in parallel (see CPxxx-ETC datasheets chapter “Parallel use to increase ouptut power” and “Parallel use for redundancy”).	BOOLEAN	RW	0x00 (0_{dec})
8001:19	Select info data 1	This object can be used to select which value is to be displayed in the Info Data 1 object (0x6000:15) (see chapter 5.4). permitted values: • 0: Min. input voltage in 0.1 V (0xFA14:11) • 1: Input undervoltage counter (0xFA14:12) • 2: Max. input voltage in 0.1 V (0xFA14:13) • 4: Max. peak input voltage in 0.1 V (0xFA14:15) • 5: Input overvoltage counter (0xFA14:16) • 6: Max. output voltage in 0.1 V (0xA000:11) • 7: Max. output current in 0.01 A (0xA000:12) • 8: Min. temperature in 0.1°C (0xFA14:17) • 9: Max. temperature in 0.1°C (0xFA14:18) • 10: Actual RMS input voltage in 0.1 V (0xFA14:19) • 14: Actual temperature in 0.1°C (0xFA14:18)	UINT8	RW	0x00 (0_{dec})
8001:21	Select info data 2	This object can be used to select which value is to be displayed in the Info Data 2 object (0x6000:16) (see chapter 5.4). permitted values: see subindex 0x8001:19	UINT8	RW	0x00 (0_{dec})
8001:41	Default Start Up Output State	This object can be used to change the start-up behavior (see chapter 2) 0: Enable Output (Default) 1: Disable Output	UINT8	RW	0x00 (0_{dec})

Index F814 PSU Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
F814:0	PSU Settings		UINT8	RO	0x11 (17_{dec})
F814:11	Overtemperature warn threshold	Adjustable warning threshold for overtemperature from -40°C to +130°C Default value: +120°C Hysteresis: 2°C If the internal device temperature (0xFA14:1B) exceeds this value, the warning bit (0x6000:01) is set in the input process data.	REAL32	RW	0x42F00000 (1123024896_{dec})

4.5. Configuration data (vendor-specific)

Index 800F PSU Vendor data

Index (hex)	Name	Meaning	Data type	Flags	Default
800F:0	PSU Vendor data		UINT8	RO	0x16 (22_{dec})
800F:15	Nominal voltage	Output-side nominal voltage of the device in V, cannot be changed.	REAL32	RO	0x00 (0_{dec})
800F:16	Nominal current	Output-side nominal current of the device in A, cannot be changed.	REAL32	RO	0x00 (0_{dec})

4.6. Command object

Index FB00 PSU Command

Index (hex)	Name	Meaning	Data type	Flags	Default
FB00:0	PSU Command		UINT8	RO	0x03 (3_{dec})
FB00:01	Request	A write access to this object executes the corresponding command. 0x7001: Reset all counters and min. and max. values in the "PSU Diag Data" 0xA000 and 0xFA14 0x7002: Reset all events from the [JSON file] (see chapter 5.5)	OCTET-STRING[2]	RW	{0}
FB00:02	Status	0: last command completed, no errors, no response data 1: last command completed, no errors, response data available 2: last command completed, error, no response data 3: last command completed, error, response data available 4-99: reserved for future use 100-200: indicates how much of the command was executed (in %, 100 = 0%, 200 = 100%) 201-254: reserved for future use 255: command is executed (if the percentage display is not supported)	UINT8	RO	0x00 (0_{dec})
FB00:03	Response	Byte 0: see SubIndex 2 Byte 1: unused 2-n: Service response data	OCTET-STRING[6]	RO	{0}

4.7. Information - diagnostic data

Index A000 PSU Diag data

Index (hex)	Name	Meaning	Data type	Flags	Default
A000:0	PSU Diag data		UINT8	RO	0x20 ($32d_{ec}$)
A000:11	Max. output voltage	• Maximum output voltage in V. • The value for the maximum output voltage is updated again if the old value is exceeded. • Is reset to the current value by writing any value. • Is retained beyond one PowerCycle.	REAL32	RW	0x00000000 (0_{dec})
A000:12	Max. output current	Maximum output current in A. • The value for the maximum output current is updated again if the old value is exceeded. • Is reset to the current value by writing any value. • Is retained beyond one PowerCycle.	REAL32	RW	0x00000000 (0_{dec})
A000:13	Actual output voltage	Value of the current output voltage in V Accuracy: typ. ±0.2% FSV (full scale value, typ. 0 to 65 V)	REAL32	RO	0x00000000 (0_{dec})
A000:14	Actual output current	Value of the current output current in A Accuracy: typ. ±0.2% FSV (full scale value, typ. 0 to 65 A)	REAL32	RO	0x00000000 (0_{dec})

Index F914 PSU Info data

Index (hex)	Name	Meaning	Data type	Flags	Default
F914:0	PSU Info data		UINT8	RO	0x14 (20_{dec})
F914:12	Operating time	Total operating time of the device in s (cannot be reset)	UINT32	RO	0x00000000 (0_{dec})
F914:13	Uptime	Operating time since last AC-side switch-on process in s (cannot be reset)	UINT32	RO	0x00000000 (0_{dec})
F914:14	Turn on counter	Total number of AC-side turn-on operations of the power supply during the complete operating time (cannot be reset)	UINT32	RO	0x00000000 (0_{dec})

Index FA14 PSU Diag data

Index (hex)	Name	Meaning	Data type	Flags	Default
FA14:0	PSU Diag data		UINT8	RO	0x14 (20_{dec})
FA14:11	Min. input voltage	Minimum RMS input voltage in V_{RMS}. The value is updated again if it falls below the old value. The input voltage averaged over 10 mains periods is used as the reference value. Undervoltages due to a grid disconnection are not taken into account.	UINT32	RW	0x00000000 (0_{dec})
FA14:12	Input undervoltage counter	Number of undervoltage events of the RMS input voltage.	UINT16	RW	0x0000 (0_{dec})

FA14:13	Max. input voltage	Maximum RMS input voltage in V_{RMS}. The value is updated again if the old value is exceeded. The input voltage averaged over 10 mains periods is used as the reference value.	UINT32	RW	0x00000000 (0_{dec})
FA14:15	Max. peak input voltage	Maximum peak input voltage from 0 V to 700 V. The value is updated again if the old value is exceeded.	REAL32	RW	0x00000000 (0_{dec})
FA14:16	Input overvoltage counter	Number of overvoltage events of the RMS input voltage. The counter for the input overvoltages is also increased if fast input voltage transients such as the VDE 0160 pulse or a surge pulse (EN 61000-4-5) occur.	UINT16	RW	0x0000 (0_{dec})
FA14:17	Min. temperature	Minimum internal device temperature in °C. The value for the minimum device temperature is updated again if it falls below the old value.	REAL32	RW	0x00000000 (0_{dec})
FA14:18	Max. temperature	Maximum internal device temperature in °C. The value for the maximum device temperature is updated again if the old value is exceeded.	REAL32	RW	0x00000000 (0_{dec})
FA14:19	Actual RMS input voltage	RMS value of the current input voltage in VRMS. Accuracy: typ. ±0.7% FSV (typ. 0 to 700 V)	REAL32	RO	0x00000000 (0_{dec})
FA14:1B	Actual temperature	Value of the current internal device temperature in °C. Accuracy: typ ±1°C	REAL32	RO	0x00000000 (0_{dec})
All values of object 0xFA14 with flag: "RW" • are retained beyond one PowerCycle, • can be reset with any value via write access (counter to 0, all other values to the current value) (see chapter 5.6)					

Index F000 Modular Device profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular Device Profile	General information for the Modular Device Profile	UINT8	RO	0x02 (2_{dec})
F000:01	Index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0001 (1_{dec})

5. Appendix

5.1. Restoring the delivery state

To restore the delivery state (factory settings) of CoE objects for EtherCAT devices (“slaves”), the CoE object *Restore default parameters*, SubIndex 001 can be used via EtherCAT master (e.g. TwinCAT) (see Fig. 5.1-1).

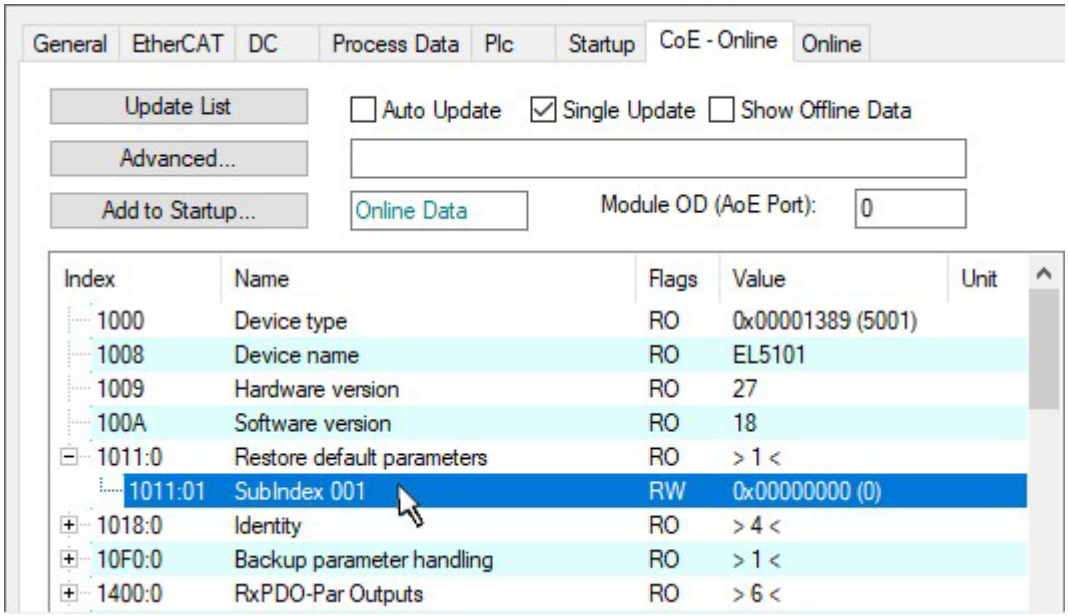


Fig. 5.1-1: Selecting the restore default parameters PDO

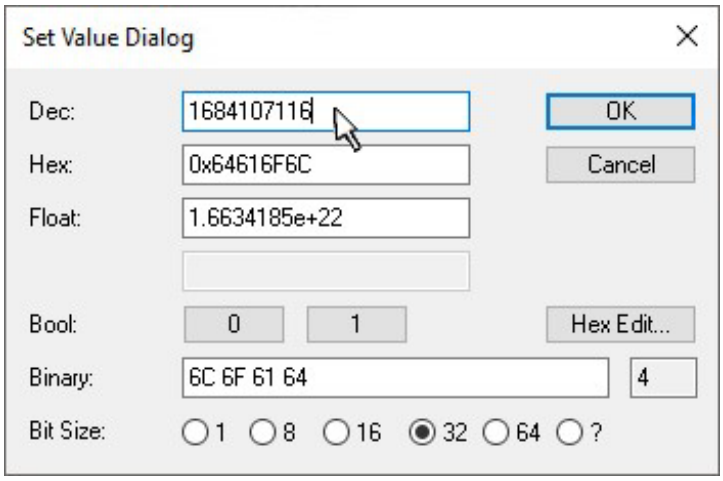


Fig. 5.1-2: Entering a restore value in the Set Value dialog

Double-click on *SubIndex 001* to enter the Set Value dialog. Enter the reset value **1684107116** in field *Dec* or the value **0x64616F6C** in field *Hex* (ASCII: "load") and confirm with *OK* (see Fig. 5.1-2).

- All changeable entries in the slave are reset to the default values.
- The values can only be successfully restored if the reset is directly applied to the online CoE, i.e. to the slave. No values can be changed in the offline CoE.
- TwinCAT must be in the RUN or CONFIG/Freerun state for this; that means EtherCAT data exchange takes place. Ensure error-free EtherCAT transmission.
- No separate confirmation takes place due to the reset. A changeable object can be manipulated beforehand for the purposes of checking.

All backup objects are reset to the delivery state.

5.2. Display of errors and warning messages

Diag History If a warning or error state is present and the warning or error bit has been set, the detailed warning or error messages can be read in the "Diag History" tab of the power supply

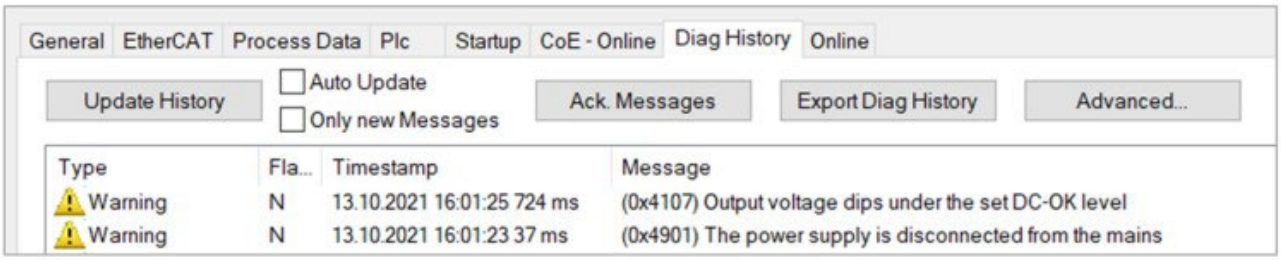


Fig. 5.2-1: Diag History tab with warning messages

TwinCAT EventLogger

Alternatively, warnings and error messages are also displayed in the TwinCAT EventLogger.

Open the TwinCAT EventLogger via the "View" menu and select "Other Windows" -> TwinCAT Logged Events.

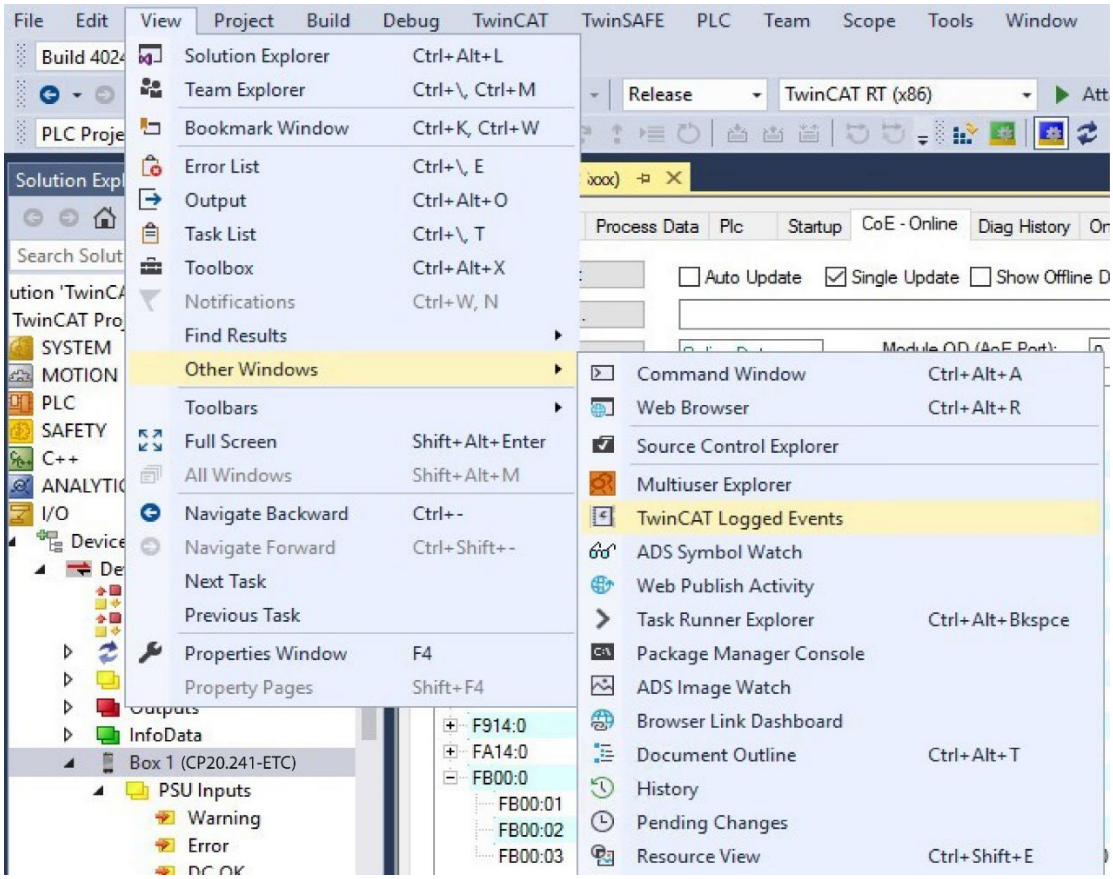


Fig. 5.2-2: Open TwinCAT EventLogger

5.3. Setting the warning thresholds for the warning bit

Adjustable warnings

The adjustable warning thresholds can be used to set application-specific limits above which an overvoltage, overcurrent or too low voltage is to be detected at the output and a warning of too high a temperature in the device is to be issued. The warnings can thus be individually adapted to the system.

While the warning bit (0x6000:01 see chapter 4.2) only indicates the warning state, the detailed warning messages can be read in the TwinCAT EventLogger and the Diag History.

Please note that if the absolute, device-specific overvoltage, overcurrent and overtemperature limits are exceeded, the power supply switches to error mode (0x6000:02 see chapter 4.2).

The warning thresholds are set in the CoE Online tab under 0x8000 (see chapter 4.4) and 0xF814 (see chapter 4.2) "PSU Settings":

Index	Name
0x8000:14	Overvoltage warn threshold
0x8000:15	Overcurrent warn threshold
0x8000:16	DC OK threshold
0xF814:11	Overtemperature warn threshold

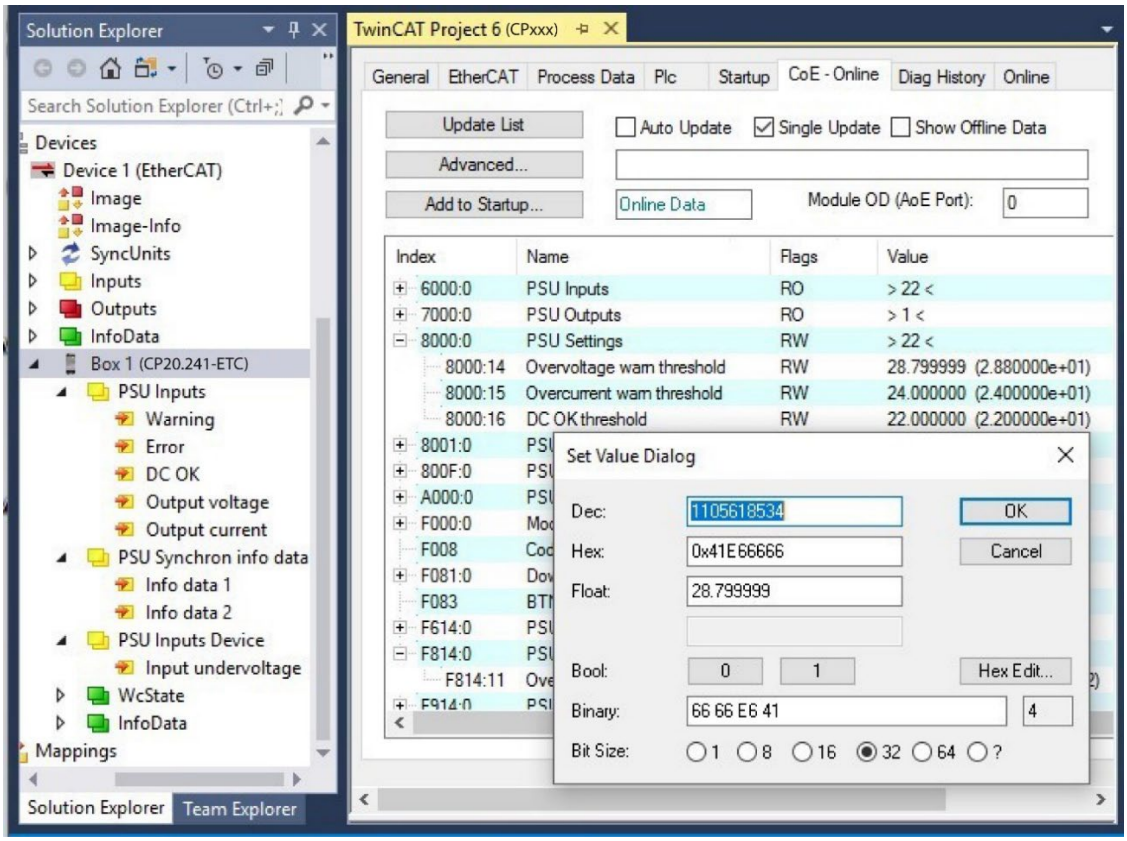


Fig. 5.3-1: Set values for warning thresholds e.g. 0x8000:14 "Overvoltage warn threshold" using the CP20.241-ETC as an example

1. Double-click on the corresponding warning threshold. The "Set Value Dialog" dialog box opens.
2. Enter the corresponding threshold value under "Float" and close the dialog box with "OK".

5.4. Selecting the info data

Updating the info data objects

In addition to the process data transmitted by default, some variables from the "PSU Diag Data" objects can be displayed via the two info data objects "Info data 1" "0x6000:15" and "Info data 2" and then linked to PLC variables.

Note that although the info data is transmitted on every process data cycle, it typically contains new values only every 52 ms.

The info data is selected in two steps:

1. In the "Process data" tab of the power supply, select the Predefined PDO Assignment "Standard + Synchron info data".

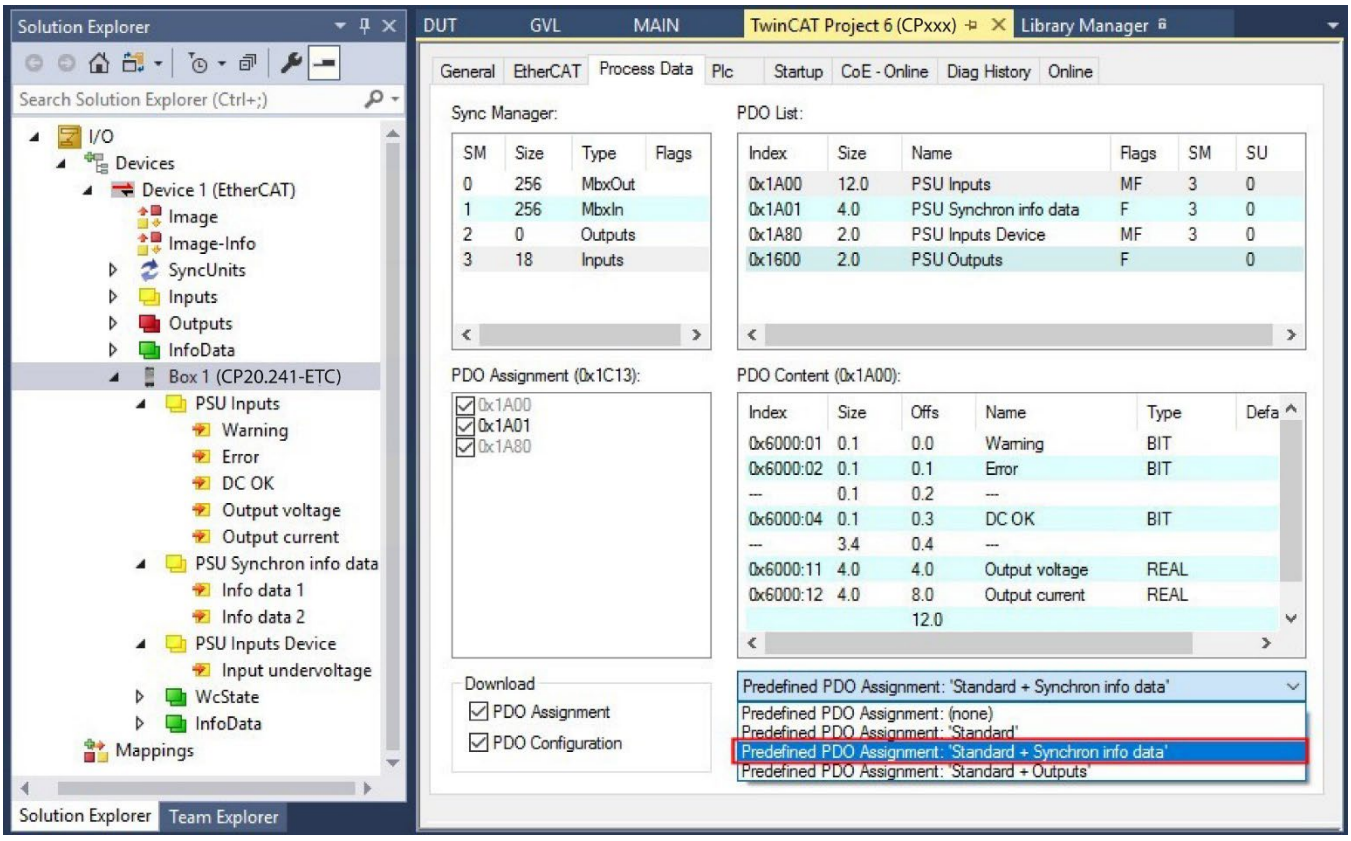


Fig. 5.4-1: Selection of process data set "Standard + Synchron info data" in the Process Data tab using the CP20.241-ETC as an example

Select the info data via the CoE-Online tab under object 0x8001 (see chapter 4.4).

⇨ Double-click on the object 0x8001:19 "Select Info data 1" or 0x8001:21 "Select Info data 2"

⇨ The "Set Value Dialog" dialog box opens

⇨ Select the desired entry from the drop-down menu under "Enum" (see following tables).

The following sizes from "PSU Diag Data" can be selected

⇨ Close the dialog box with "OK"

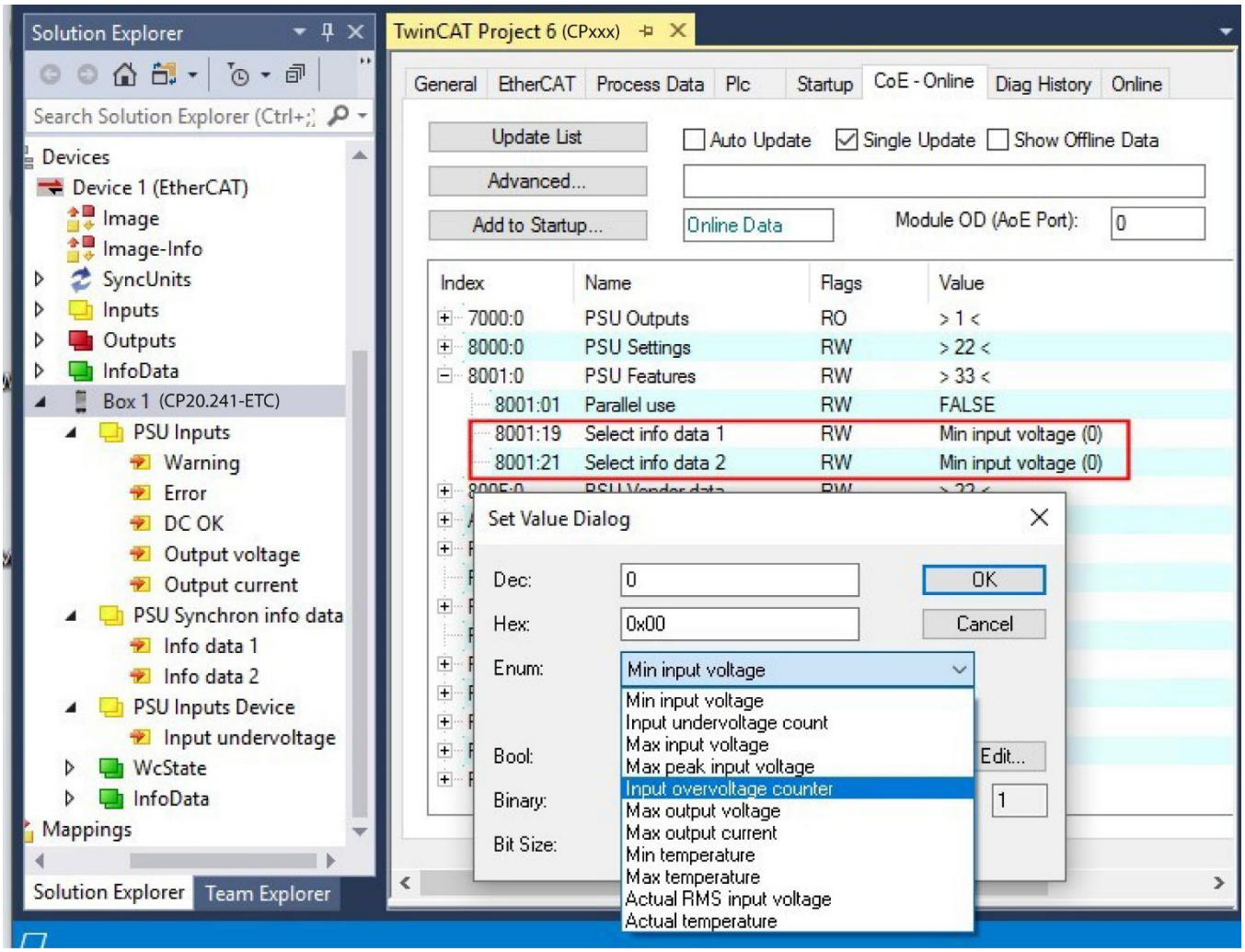


Fig. 5.4-2: Select info data under "PSU Features" using CP20.241-ETC as an example

The following entries of the "PSU Diag Data" can be selected in the objects 0x8001:19 and 0x8001:21:

Information on the input side	
Enum (Dec) in index 0x8001:19 or 0x8001:21	**Index "PSU Diag data"**
Min. input voltage (0)	0xFA14:11
Input undervoltage count (1)	0xFA14:12
Max. input voltage (2)	0xFA14:13
Max. peak input voltage (4)	0xFA14:14
Input overvoltage counter (5)	0xFA14:16
Actual RMS input voltage (10)	0xFA14:19
Information on the output side	
Enum (Dec) in index 0x8001:19 or 0x8001:21	**Index "PSU Diag data"**
Max. output voltage (6)	0xA000:11
Max. output current (7)	0xA000:12

Temperature information	
Enum (Dec) in index 0x8001:19 or 0x8001:21	**Index "PSU Diag data"**
Min. temperature (8)	0xFA14:17
Max. temperature (9)	0xFA14:18
Actual temperature (14)	0xFA14:1B

Differentiation between counters, current values and maximum/minimum values

The entries of the "PSU Diag Data" are divided into values, counters and maximum/minimum values.

Objects that contain counters or maximum/minimum values can be reset if required (see chapter 5.6)

Using info data for network and system monitoring

With the variables recorded as process data by default and the additional info data, both the operating state of the system and network monitoring can be realised on the input side. Details on the data recorded on the input side can be found in chapter 3 "Information on grid monitoring on the input side".

5.5. JSON

The power supplies of the CP10 and CP20 series with EtherCAT interface have the option of retrieving a log file in the form of a JSON document. This contains, for example, the currently set threshold values, minimum and maximum voltages and currents that have occurred, as well as an error history. The file also contains static product properties such as the nominal current, nominal voltage, product name and a unique serial number.

The error history contains up to ten undervoltage, overvoltage, overcurrent and overtemperature events. The value of the over/underrun and the time of occurrence are stored for each event.

Exemplary representation of the JSON file.


```
{
  "Product": "CP20.481-ETC",
  "BIC": "1P551049SBTNasdfghjk1KPS2001-4810-1001              Q1    52SP12345678           ",
  "NominalCurrent": 20.000000,
  "NominalVoltage": 24.000000,
  "MinInputVoltage": 228.000000,
  "MaxInputVoltage": 240.000000,
  "MaxPeakInputVoltage": 340.000000,
  "InputUndervoltageCounter": 0,
  "InputOvervoltageCounter": 0,
  "MaxOutputVoltage": 28.531250,
  "MaxOutputCurrent": 0.062500,
  "MinTemperature": 18.656250,
  "MaxTemperature": 30.156250,
  "DcOkThreshold": 23.000000,
  "OvervoltageWarnThreshold": 28.799999,
  "OvercurrentWarnThreshold": 24.000000,
  "OvertemperatureWarnThreshold": 120.000000,
  "UndervoltageEvents":
  [
    {
      "Value": 22.386719,
      "DcTimestamp": 695747772293000000,
      "Time": "2022-01-17T15:16:12"
    }
  ]
}
```


Reading the JSON log file

The file can be read via a FoE upload

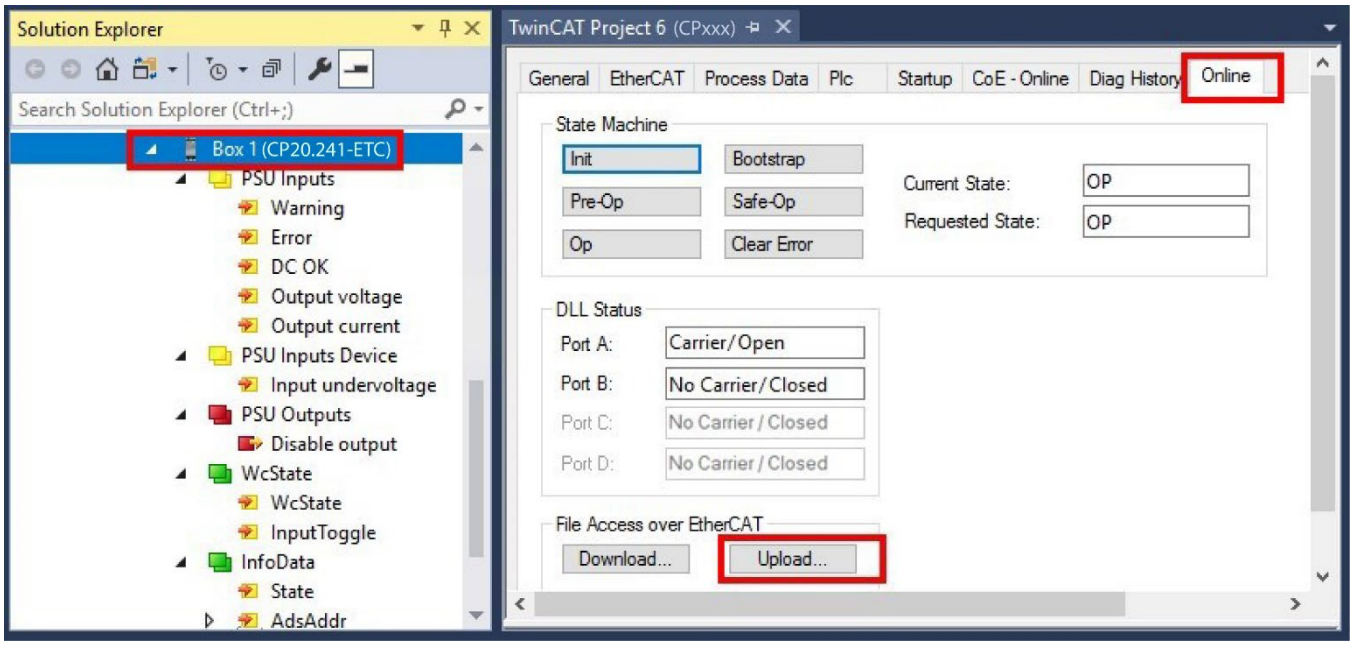


Fig. 5.5-1: Reading the JSON log file using the CP20.241-ETC as an example

- In the following dialog, enter "Logfile.json" as the file name and press "Save".
- Confirm the following dialog "Edit FoE Name" with "OK".

Update the time for the JSON file

The power supply has no information on the current local time. For this reason, the time of the events is always displayed as 0 by default.

The CoE object 0x10F9:01 can be used to inform the EtherCAT slave of the current time. The time of this object corresponds to the notation for 64-bit EtherCAT timestamps.

Theoretically, it is sufficient to transfer the current time once after switching on. The internal clock of the power supply unit is set and continues to run automatically. However, to ensure that the time of the master and the power supply unit do not drift apart, a regular update is recommended. (e.g. every minute).

MAIN Source Control Explorer

```
PROGRAM MAIN
VAR
    ActTime         : T_DCTIME64;
    Delay           : TON;
    CoeWrite        : FB_EcCoESdoWrite;
    AmsAddr AT %I*  : ST_AmsAddr;
END_VAR
```

```
Delay(IN:=NOT Delay.Q, PT:=T#60S);

ActTime := F_GetActualDcTime64();

IF Delay.Q THEN
    CoeWrite(bExecute := TRUE);
END_IF

CoeWrite.bExecute    := FALSE;;
CoeWrite.cbBufLen    := SIZEOF(T_DCTIME);
CoeWrite.nIndex      := 16#10F9;
CoeWrite.nSubIndex   := 16#01;
CoeWrite.nSlaveAddr  := AmsAddr.port;
CoeWrite.sNetId      := F_CreateAmsNetId(AmsAddr.netId);
CoeWrite.pSrcBuf     := ADR(ActTime);
CoeWrite();
```

Fig. 5.5-2: Sample code for writing the time every minute

PLC library:Tc3_JsonXml

With the aid of the PLC library Tc3_JsonXml, SAX and DOM parser technologies can be used to create and navigate through JSON and XML documents.

5.6. Resetting individual counters and maximum/minimum values

Resetting individual counters and maximum/minimum values is possible in the "CoE-Online" tab under the two "PSU Diag Data" objects (0xA000, 0xFA14)

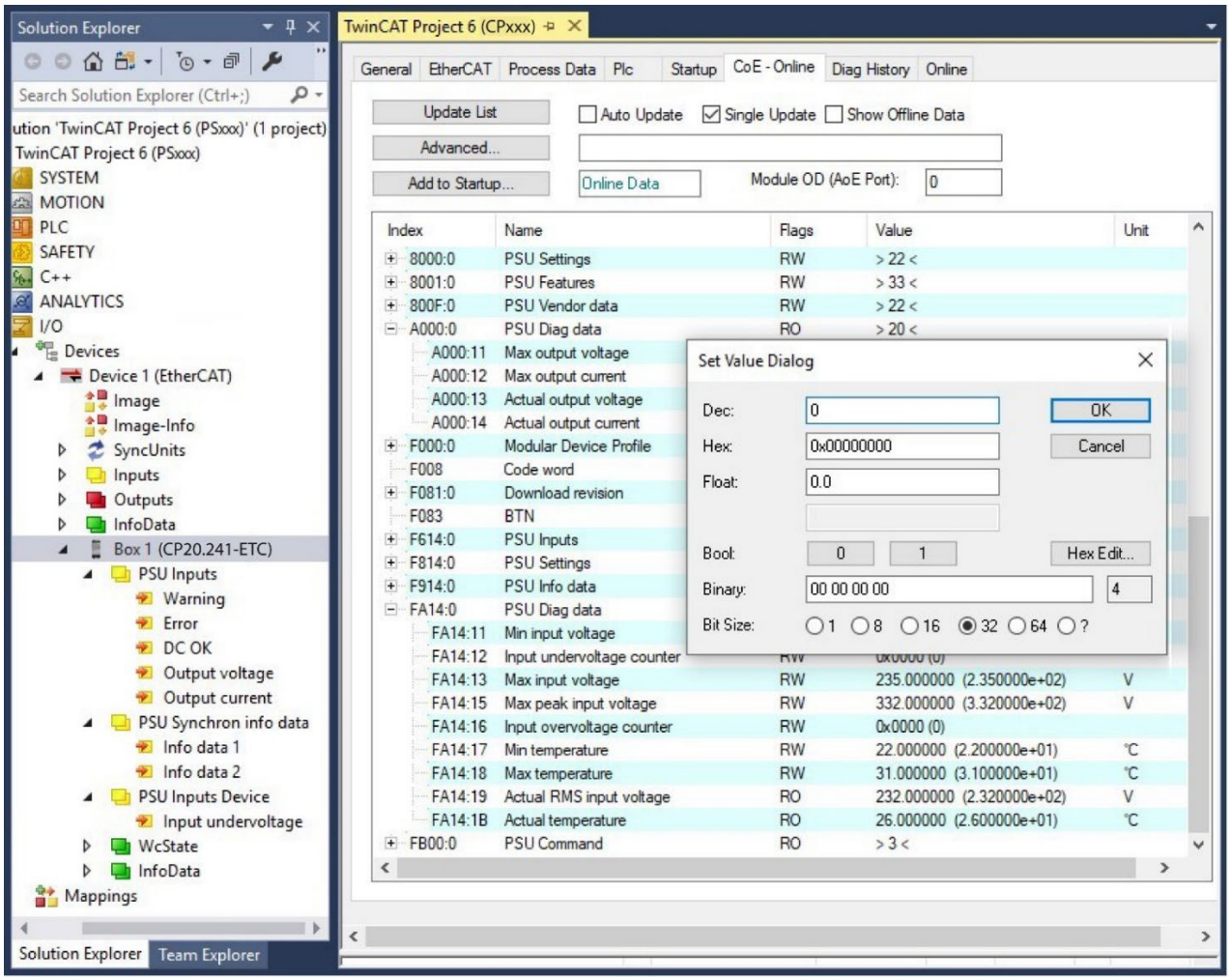


Fig. 5.6-1: Reset e.g. 0xA000:11 "Max. output voltage" using the CP20.241-ETC as an example

1. Double-click on the counter or maximum/minimum value that you want to reset. The "Set Value Dialog" dialog box opens
2. With a write access (e.g. with the value 0), which you confirm with "OK",
   ⇨ the corresponding counter is reset to 0,
   ⇨ all other values have the current value after resetting.

No writing of 0xA000, 0xFA14 with certain values

Only resetting the values is possible via write access.

It is not possible to write specific values to the counters or maximum/minimum values.

- Regardless of the value entered, due to the write access
  ⇨ the value of counters is always reset to zero,
  ⇨ all other values have the current value after resetting.

Resetting all counters and maximum/minimum values

Resetting all counters to 0 and minimum/maximum values to the current values is possible in the "CoEOnline" tab via the "PSU Command" object (0xFB00):

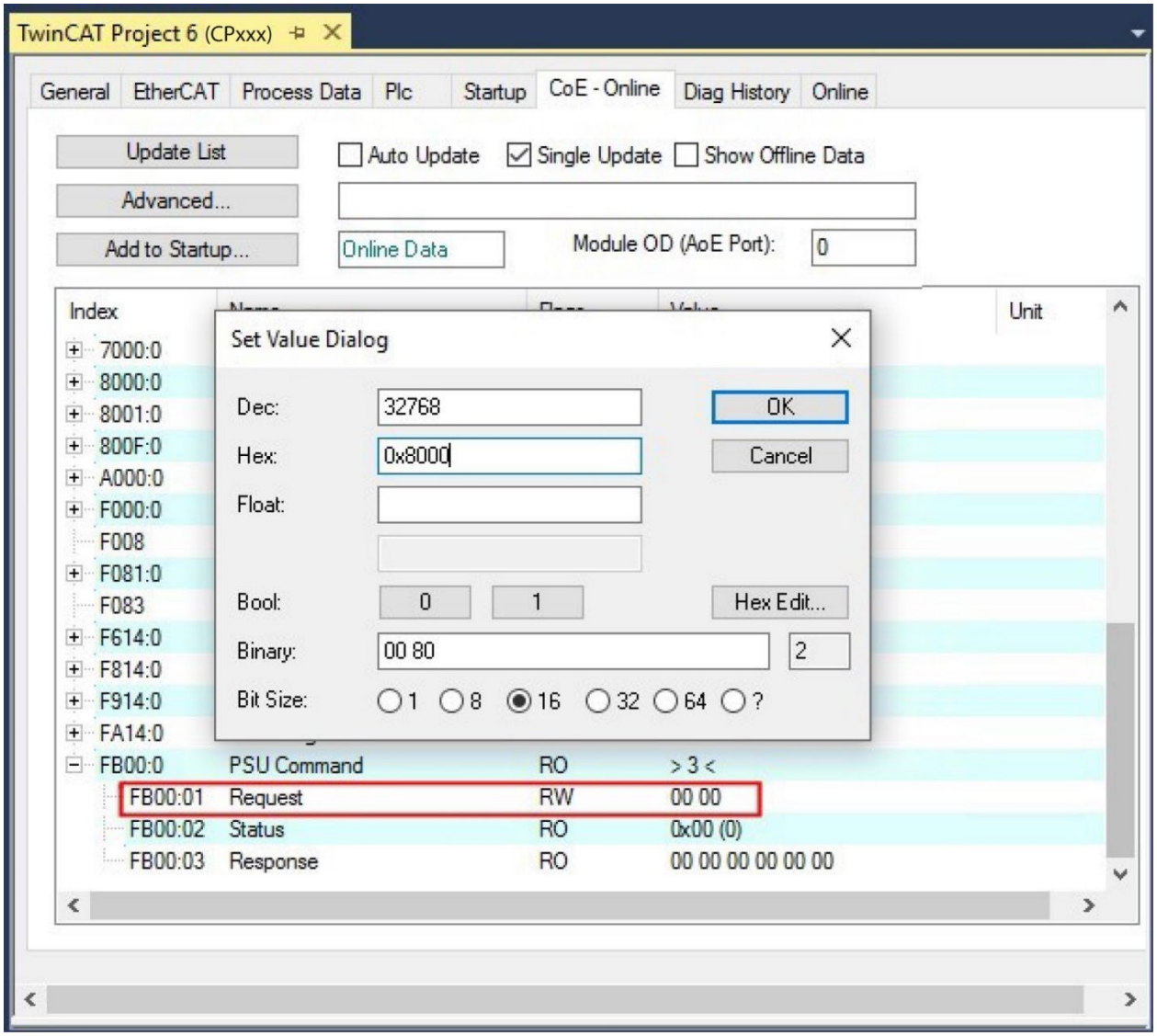


Fig. 5.6-2: Reset all counters and maximum/minimum values via 0xFB00:01

1. Double-click on the object 0xFB00:01. The "Set Value Dialog" dialog box opens
2. Enter the desired value under "Hex". The following values can be specified:
   ⇨ 0x7001: Reset all min./max. values in the objects 0xA000 and 0xFA14
   ⇨ 0x7002: Delete exceeded threshold values from the JSON log
3. Confirm with "OK".
   ⇨ In the "PSU Diag Data", all counters are set to zero, maximum/minimum values have the current values or
   ⇨ Threshold value violations are deleted from the JSON log.