SIEMENS

SIMATIC

ET 200SP
PROFIenergy product information

Product Information

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Security information

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. You can find more information about industrial security on the Internet (http://www.siemens.com/industrialsecurity).

1.1 Introduction

Introduction

PROFIenergy is a data interface based on PROFINET for switching off consumers centrally and in a coordinated manner during idle times, regardless of the manufacturer or device type. The goal is that the process is only provided with the energy that is absolutely required. The majority of the energy is saved by the process itself; the PROFINET device itself only contributes a few watts of saving potential. This operating mode is termed "pause" in PROFIenergy.

The PROFINET devices are turned off by special commands in the user program of the PROFINET IO controller. No additional hardware is required; the PROFIenergy commands are directly interpreted by the PROFINET devices.

The device which provides the PROFIenergy interface and supports the required control data record has the so-called PE-Entity, the access point for these control data records. This PE-Entity is located on the interface module as a substitute for I/O modules that do not have their own PE-Entity. I/O modules that have their own PE-Entity are always addressed directly.

Requirements

- Interface module IM 155-6 PN ST
- Interface module IM 155-6 PN HF
- ET 200SP I/O modules which support PROFIenergy
  - Digital input module DI 8x24VDC ST (6ES7131-6BF00-0BA0)
  - Digital input module DI 8x24VDC HF (6ES7131-6BF00-0CA0)
  - Digital input module DI 8xNAMUR HF (6ES7131-6TF00-0CA0)
  - Digital input module DI 8x24VDC HS (6ES7131-6BF00-0DA0)
  - Digital output module DQ 4x24VDC/2A ST (6ES7132-6BD20-0BA0)
  - Digital output module DQ 4x24VDC/2A HF (6ES7132-6BD20-0CA0)
  - Digital output module DQ 4x24VDC/2A HS (6ES7132-6BD20-0DA0)
  - Digital output module DQ 8x24VDC/0,5A ST (6ES7132-6BF00-0BA0)
  - Digital output module DQ 8x24VDC/0,5A HF (6ES7132-6BF00-0CA0)
  - Digital output module DQ 16x24VDC/0,5A ST (6ES7132-6BH00-0BA0)
  - Digital output module DQ 4x24..230VAC/2A ST (6ES7132-6FD00-0BB1)
  - Digital output module RQ 4x24VUC/2A CO ST (6ES7132-6GD50-0BA0)
  - Digital output module RQ 4x120VDC-230VAC/5A NO ST (6ES7132-6HD00-0BB0)
  - Digital output module RQ 4x120VDC-230VAC/5A NO MA ST (6ES7132-6MD00-0BB1)
  - Analog input module AI 2xU ST (6ES7134-6FB00-0BA1)
  - Analog input module AI 2xI 2-/4-wire ST (6ES7134-6GB00-0BA1)
  - Analog input module AI 4xI 2-/4-wire ST (6ES7134-6GD00-0BA1)
  - Analog input module AI 2xU/I 2-/4-wire HF (6ES7134-6HB00-0CA1)
  - Analog input module AI 4xU/I 2-wire ST (6ES7134-6HD00-0BA1)
  - Analog input module AI 2xU/I 2-/4-wire HS (6ES7134-6HB00-0DA0)
  - Analog output module AQ 2xU ST (6ES7135-6FB00-0BA1)
  - Analog output module AQ 2xI ST (6ES7135-6GB00-0BA1)
  - Analog output module AQ 4xU/I ST (6ES7135-6HD00-0BA1)
  - Analog output module AQ 2xU/I HF (6ES7135-6HB00-0CA1)
  - Analog output module AQ 2xU/I HS (6ES7135-6HB00-0DA1)
  - Communication module IO-Link Master CM 4xIO-Link (6ES7137-6BD00-0BA0)
- User program for sending the parameter data record, index 3
- User program with the function blocks for controlling the PROFIenergy commands ("PE_START_END" - FB 815, "PE_CMD" - FB 816).

Procedure

1. Create the parameter data record, Index 3 in STEP 7
2. Transfer the parameter data record to the interface module with the instruction "WRREC" - SFB 53.
3. Create the user program with the FBs for controlling the PROFIenergy commands ("PE_START_END" - FB 815, "PE_CMD" - FB 816).
4. Transfer the user program to the CPU.

Additional information

- System manual ET 200SP Distributed I/O System
- Device manual Interface Module
- Device manuals Digital and Analog I/O Modules
- System manual PROFINET System Description
- You will find additional information on PROFIenergy services, parameters of the service IDs on the Internet under Common Application Profile PROFIenergy; Technical Specification for PROFINET; Version 1.0; January 2010; Order No: 3.802.
- Additional information on PROFIenergy FBs ("PE_START_END" - FB 815, "PE_CMD" - FB 816) is available in the online help for STEP 7 V5.5 as of SP2 "Help on System Functions/System Function Blocks".

1.2 Principle of operation

"Pause" control and "Pause" behavior

At the beginning and end of pauses, you enable or disable the pause function of the system; the IO controller then sends the PROFIenergy command "Start_Pause" or "End_Pause" to the PROFINET devices. The device then interprets the contents of the PROFIenergy command and switches on or off. The interface module is the PE-Entity for I/O modules with PROFIenergy capability of the ET 200SP.

Other PROFIenergy commands allow device information to be accessed during the pauses. You can use these commands to transfer the "Start_Pause" / "End_Pause" command in good time.

Note

A complete PROFIenergy sequence consists of the commands "Start_Pause" and "End_Pause". Always observe this sequence during programming.

LED displays

In general, PROFIenergy does not have an effect on the LED display. Please see the device manuals of the relevant I/O modules for exceptions.

Response to error detection

All channels whose pause mode is set to "PE_MODE_PROCEED" report errors as in productive operation.

The following rules apply to channels which switch to a pause mode other than "PE_MODE_PROCEED":

- All errors that are unrelated to the switch to "Pause" are reported.
- If error recognition is possible during "Pause", these errors continue to be reported.
- All error messages which are caused by the switch to "Pause" are suppressed.
- The following applies if error recognition is not possible during the "Pause":
  - The status of errors already pending before the "Pause" is retained.
  - Incoming and outgoing errors are reported once the "pause" has ended.

Note

Switching to "Pause" and out of "Pause" may cause an error to be reported.

Additional information

Additional information on diagnostics can be found in the I/O module device manuals.

Hardware interrupt

No hardware interrupts are triggered within the "pause". The hardware interrupts are re-evaluated when the "pause" ends.

"Pause" behavior under certain operating conditions

A "Pause" is ended in the following cases:

Table 1- 1 Ending a "pause"

Ending a "pause"	Explanation
The supply voltage 1L+ of the interface module has failed	The "pause" is exited and can be re-activated by re-sending the PROFIenergy parameter assignment followed by the "Start_Pause" command.
• Controller stop[1] • Controller failure (connection interrupted)[1] • Firmware update • Reset to factory settings • Deactivation of the IO device[1]	
The I/O module is pulled and plugged	
Station stop[1] • Removal of more than one I/O module (depending on the interface module used) • Dismounting of the server module	The "pause" is exited , the PROFIenergy parameter assignment is still on the I/O module and the "pause" can be re-activated by the "Start_Pause" command.
Failure of the supply voltage L+ of the I/O module.	
Modification of the parameter settings of the I/O module during operation using data record 128	

[1] The substitute value behavior is activated.

1.3 Parameter assignment

Parameter assignment

- Parameter assignment of PROFIenergy takes place by means of the user program and parameter data record (version2), index 3. The interface module distributes the PROFIenergy parameters to the I/O modules.
- The parameter assignment of an additional pause behavior is possible immediately after the start of the previous "Pause". The required state for the following pause is activated with a new "Start_Pause" command.
- The parameter assignment can be written as often as necessary.
- The interface module checks the distribution of the parameters to the I/O modules and returns the result of the write job by means of return value. In the case of a negative return value, there are one or more I/O modules that have not accepted the parameter data record. In this case, the I/O modules respond according to their last valid PROFIenergy parameter assignment with an incoming "Start_Pause" command.
- Parameter assignment by means of the parameter data record has to be repeated in case of an I/O module failure or station failure.
- ET 200SP supports the setting for the behavior of **one** "Pause". If a different response is required for an additional "Pause", you will have to assign parameters again.

Note

Effect: The response (shutdown) of the I/O modules to PROFIenergy is related to the slot, which means that all channels of the slot show the same behavior.

Parameter data record

You specify which I/O modules (slots) are controlled with PROFIenergy commands in the parameter data record for PROFIenergy.

The content of the parameter data record for PROFIenergy, index 3 is described below; you can create it yourself and transmit it to the interface module.

Table 1- 2 Parameter data record for PROFIenergy (version 2), index 3

Byte	Element		Coding	Explanation
0	Version		02_D	Cannot be modified
1	Number of blocks		01_D to n	Slots 1 to n depending • on the number of slots supported by the interface module and • the current configuration of the ET 200SP.
2	Block 1	Slot number	00_D	Unassigned
			01_D to n	I/O module slot with PROFIenergy
3		Mode	0_D: PE_MODE_PROCEED, proceed at "Pause" 1_D: PE_MODE_SHUTDOWN, shut down at "Pause" [1] 3_D: PE_MODE_LAST_VALUE, last output or measured value is retained 4_D: PE_MODE_SUBST_VALUE, substitute value "0" [2]	
:	:	:	:	
128	Block 64	Slot number	See Block 1	
129		Mode		

[1] The specific behavior depends on the used I/O module (with a digital input module, for example, the sensor supply is turned off or the outputs of an analog output module are de-energized)

[2] An analog output module (e. g. with the output range 0 mA to 20 mA, ± 20 mA) or a digital output module issues the value "0".

Error messages

The feedback data record returns the following error messages, if needed:

Table 1- 3 Error messages

Error code	Meaning	
$80B1_H$	Impermissible length	Check the length of the data record
$80E0_H$	Error in header information	Check the data record header information
$80E1_H$	Parameter error • At least one I/O module does not support PROFIenergy • A parameter value has been incorrectly encoded	Check the content of the data record and correct the parameter assignment error before starting the "Pause". Parameter assignment errors which are not corrected can result in incorrect I/O module shutdown behavior.

1.4 PROFIenergy control data records

PROFIenergy control data records

The control data record for PROFIenergy, Index $80A0_H$, supports the following services of the Common Application Profile PROFIenergy V1.0 for the IM 155-6 PN ST, IM 155-6 PN HF:

Table 1- 4 Control data records for PROFIenergy

Service	Service ID	Meaning
Start pause [1]	01_H	Assuming the configured Pause behavior, suppressing all associated diagnostics data
End Pause	02_H	Leaving the pause
Query Modes	03_H	Reads the supported modes • Request List Energy Saving Modes • Request Get Mode (Energy Saving Mode Data)
PEM status	04_H	Reads the PROFIenergy status Status messages: • 00_H: PROFIenergy is ready for operation • 01_H: "Pause" is active • FF_H: "Pause" is not active
PE_Identify	05_H	Reads the supported PROFIenergy services

[1] The minimum (configurable) pause time for the ET 200SP is 10 s.

1.5 I/O modules

1.5.1 Digital input module

Requirements

- Digital input module DI 8x24VDC ST (6ES7131-6BF00-0BA0)
- Digital input module DI 8x24VDC HF (6ES7131-6BF00-0CA0)
- Digital input module DI 8xNAMUR HF (6ES7131-6TF00-0CA0)
- Digital input module DI 8x24VDC HS (6ES7131-6BF00-0DA0)

Display

DI 8x24VDC ST/ DI 8x24VDC HF/ DI 8x24VDC HS

- The channel LEDs are directly affected by the signal level at the terminal.
- Switching off the sensor supply also switches off the channel LED if an external sensor supply is connected.

DI 8xNAMUR

- The channel LEDs correspond to the signal state supplied by the I/O module.

Response to error detection

The error "Missing supply voltage L+" is detected, reported and ends the "pause" regardless of whether the pause status is applied.

All channels which are set to "PE_MODE_PROCEED" in pause mode report errors as in productive operation.

The following applies for all channels which switch to a different pause mode:

- Sensor supply switch-off upon the start of "pause" does not result in the messages "Line break" or "Short circuit".
- "Line break" and "Short circuit" error recognition is not possible during the "pause":
  - Messages for errors already pending before the "pause" are retained.
  - After the "pause" is over, the error status is updated and incoming/outgoing errors are reported correspondingly.

Ending a "pause"

The pause is ended in the following cases:

- Failure of the supply voltage L+
- Change in parameter assignment of I/O module with DS128
- "End_Pause" command
- Controller failure
- Firmware update
- Station stop
- Restart of the interface module

Mode parameter

Only the "Mode" parameter is shown below. The complete configuration can be found in the "Parameter assignment" chapter.

Table 1- 5 Mode parameter

Element	Coding	Explanation
Mode	0_D: PE_MODE_PROCEED	Proceed at "pause"
	1_D: PE_MODE_SHUTDOWN	Shut down at "Pause" [1] • Sensor supply switched off [2] • Pause substitute value: 0_B
	3_D: PE_MODE_LAST_VALUE	Last value at "pause" • Sensor supply switched off [2] • Pause substitute value: Last input value
	4_D: PE_MODE_SUBST_VALUE	Substitute value at "pause" • Sensor supply switched off [2] • Pause substitute value: Configured pause substitute value

1 DI 8xNAMUR HF: A channel is set to "inverted". During the "pause", the PE substitute value is read in 1:1 (as in the parameter settings and not inverted again).

2 DI 8x24VDC ST: As there is only one sensor supply for all channels, the supply can only be switched off at a "pause" if all channel parameters have been set to switch off.

1.5.2 Digital output modules

Requirements

- Digital output module DQ 4x24VDC/2A ST (6ES7132-6BD20-0BA0)
- Digital output module DQ 4x24VDC/2A HF (6ES7132-6BD20-0CA0)
- Digital output module DQ 4x24VDC/2A HS (6ES7132-6BD20-0DA0)
- Digital output module DQ 8x24VDC/0,5A ST (6ES7132-6BF00-0BA0)
- Digital output module DQ 8x24VDC/0,5A HF (6ES7132-6BF00-0CA0)
- Digital output module DQ 16x24VDC/0,5A ST (6ES7132-6BH00-0BA0)
- Digital output module DQ 4x24..230VAC/2A ST (6ES7132-6FD00-0BB1)
- Digital output module RQ 4x24VUC/2A CO ST (6ES7132-6GD50-0BA0)
- Digital output module RQ 4x120VDC-230VAC/5A NO ST (6ES7132-6HD00-0BB0)
- Digital output module RQ 4x120VDC-230VAC/5A NO MA ST (6ES7132-6MD00-0BB1)

Display

The channel LEDs are directly affected by the output value at the terminal.

Response to error detection

The error "Missing supply voltage L+" is detected, reported and ends the "pause" regardless of whether the pause status is applied.

Line break and short circuit error recognition continues to be possible during the "pause". All channels therefore report errors as in productive operation, regardless of their pause mode.

Ending a "pause"

The pause is ended in the following cases:

- Failure of the supply voltage L+ (exception: The DQ 4x24..230VAC/2A ST remains in "Pause")
- Change in parameter assignment of I/O module with DS128
- "End_Pause" command
- Controller failure
- Firmware update
- Station stop
- Restart of the interface module

Mode parameter

Only the "Mode" parameter is shown below. The complete configuration can be found in the "Parameter assignment" chapter.

Table 1- 6 Mode parameter

Element	Coding	Explanation
Mode	0_D: PE_MODE_PROCEED	Proceed at "pause"
	1_D: PE_MODE_SHUTDOWN	Switch off at "pause" • Pause substitute value: 0_B
	3_D: PE_MODE_LAST_VALUE	Last value at "pause" • Pause substitute value: Last output value is maintained[1]
	4_D: PE_MODE_SUBST_VALUE	Substitute value at "pause" • Pause substitute value: Configured pause substitute value is output

[1] DQ 4x24VDC/2A HS: In the "Pulse width modulation" mode, the last value is output as frequency.

1.5.3 Analog input modules

Requirements

- Analog input module AI 2xU ST (6ES7134-6FB00-0BA1)
- Analog input module AI 2xI 2-/4-wire ST (6ES7134-6GB00-0BA1)
- Analog input module AI 4xI 2-/4-wire ST (6ES7134-6GD00-0BA1)
- Analog input module AI 2xU/I 2-/4-wire HF (6ES7134-6HB00-0CA1)
- Analog input module AI 4xU/I 2-wire ST (6ES7134-6HD00-0BA1)
- Analog input module AI 2xU/I 2-/4-wire HS (6ES7134-6HB00-0DA0)

Display

The channel LEDs are not affected by PROFIenergy.

Response to error detection

The error "Missing supply voltage L+" is detected, reported and ends the "pause" regardless of whether the pause status is applied.

All channels which are set to "PE_MODE_PROCEED" in pause mode report errors as in productive operation.

The following applies for all channels which switch to a different pause mode:

- Sensor supply switch-off upon the start of "pause" does not result in the message "Line break".
- "Line break", "Short circuit", "High limit exceeded" and "Low limit exceeded" error recognition is not possible during the "pause":
  - Messages for errors already pending before the "pause" are retained.
  - After the "pause" is over, the error status is updated and incoming/outgoing errors are reported correspondingly.

Ending a "pause"

The pause is ended in the following cases:

- Failure of the supply voltage L+
- Change in parameter assignment of I/O module with DS128
- "End_Pause" command
- Controller failure
- Firmware update
- Station stop
- Restart of the interface module

Mode parameter

Only the "Mode" parameter is shown below. The complete configuration can be found in the "Parameter assignment" chapter.

Table 1- 7 Mode parameter

Element	Coding	Explanation
Mode	0_D: PE_MODE_PROCEED	Proceed at "pause"
	1_D: PE_MODE_SHUTDOWN	Switch off at "pause" • Sensor supply switched off [1] • Pause substitute value: $7FFF_H$
	3_D: PE_MODE_LAST_VALUE	Last value at "pause" • Sensor supply switched off [1] • Pause substitute value: Last input value
	4_D: PE_MODE_SUBST_VALUE	Substitute value at "pause" • Sensor supply switched off [1] • Pause substitute value: Configured pause substitute value

[1] AI 2xI 2-/4-wire ST, AI 4xI 2-/4-wire ST, AI 4xU/I 2-wire ST, AI 2xU/I 2-/4-wire HS: As there is only one sensor supply for all channels, the supply can only be switched off at a "pause" if all channels have been configured to switch off.

1.5.4 Analog output module

Requirements

- Analog output module AQ 2xU ST (6ES7135-6FB00-0BA1)
- Analog output module AQ 2xI ST (6ES7135-6GB00-0BA1)
- Analog output module AQ 4xU/I ST (6ES7135-6HD00-0BA1)
- Analog output module AQ 2xU/I HF (6ES7135-6HB00-0CA1)
- Analog output module AQ 2xU/I HS (6ES7135-6HB00-0DA1)

Display

The channel LEDs are not affected by PROFIenergy.

Response to error detection

The error "Missing supply voltage L+" is detected, reported and ends the "pause" regardless of whether the pause status is applied.

All channels which are set to "PE_MODE_PROCEED" in pause mode report errors as in productive operation.

The following applies to all channels which switch to the pause mode "PE_MODE_SHUTDOWN":

- "Line break" and "Short circuit" error recognition is not possible during the pause.
  - Messages for errors already pending before the "pause" are retained.
  - Incoming and outgoing errors are reported once the "pause" has ended.

The following applies for all channels which switch to a different pause mode:

- "Line break" and "Short circuit" error recognition continues to be possible during the pause. These errors are reported.
- The selection of an incorrect pause substitute value which does not correspond to the output range may result in the message "High limit exceeded" or "Low limit exceeded". The pause substitute output value effective at the terminal is limited to the high or low control limit for the output range.

Ending a "pause"

The pause is ended in the following cases:

- Failure of the supply voltage L+
- Change in parameter assignment of I/O module with DS128
- "End_Pause" command
- Controller failure
- Firmware update
- Station stop
- Restart of the interface module

Mode parameter

Only the "Mode" parameter is shown below. The complete configuration can be found in the "Parameter assignment" chapter.

Table 1- 8 Mode parameter

Element	Coding	Explanation
Mode	0_D: PE_MODE_PROCEED	Proceed at "pause"
	1_D: PE_MODE_SHUTDOWN	Switch off at "pause" • Outputs free from current and voltage
	3_D: PE_MODE_LAST_VALUE	Last value at "pause" • Pause substitute value: Last output value is maintained
	4_D: PE_MODE_SUBST_VALUE	Substitute value at "pause" • Pause substitute value: Configured pause substitute value is output

1.5.5 IO-Link Master

Requirements

Communication module IO-Link Master CM 4xIO-Link (6ES7137-6BD00-0BA0)

Note

The minimum pause time (10 s) must be observed. If it is undershot, problems may occur with the restart of IO-Link communication.

1.5.5.1 DI operating mode

Display

Switching off the supply voltage USn (port) also switches off the associated channel status LED Qn if an external supply voltage is connected.

Response to error detection

The error "Missing supply voltage L+" is detected, reported and ends the "pause" regardless of whether the pause status is adopted.

Ending a "pause"

The pause is ended in the following cases:

- Failure of the supply voltage L+
- Re-assignment of the I/O module parameters
- "End_Pause" command
- Controller failure
- Firmware update
- Station stop
- Restart of the interface module

Mode parameter

Only the "Mode" parameter is shown below. The complete configuration can be found in the "Parameter assignment" chapter.

Table 1- 9 Mode parameter

Element	Coding	Explanation
Mode	0_D: PE_MODE_PROCEED	Proceed at "pause"
	1_D: PE_MODE_SHUTDOWN	Switch off at "pause" • Supply voltage USn (port) switched off • Pause substitute value: 0_B
	3_D: PE_MODE_LAST_VALUE	Last value at "pause" • Supply voltage USn (port) switched off • Pause substitute value: Last input value
	4_D: PE_MODE_SUBST_VALUE	Substitute value at "pause" • Supply voltage USn (port) switched off • Pause substitute value: Configured pause substitute value

1.5.5.2 DQ operating mode

Display

The channel status LEDs Qn show the output value.

Response to error detection

The error "Missing supply voltage L+" is detected, reported and ends the "pause" regardless of whether the pause status is adopted.

Ending a "pause"

The pause is ended in the following cases:

- Failure of the supply voltage L+
- Re-assignment of the I/O module parameters
- "End_Pause" command
- Controller failure
- Firmware update
- Station stop
- Restart of the interface module

Mode parameter

Only the "Mode" parameter is shown below. The complete configuration can be found in the "Parameter assignment" chapter.

Table 1- 10 Mode parameter

Element	Coding	Explanation
Mode	0_D: PE_MODE_PROCEED	Proceed at "pause"
	1_D: PE_MODE_SHUTDOWN	Switch off at "pause" • Pause substitute value: 0_B
	3_D: PE_MODE_LAST_VALUE	Last value at "pause" • Pause substitute value: Last output value is maintained
	4_D: PE_MODE_SUBST_VALUE	Substitute value at "pause" • Pause substitute value: Configured pause substitute value is output

1.5.5.3 IO-Link operating mode

Display

When supply voltage USn (port) is switched off, the associated port status LED Cn and port error LED Fn are also switched off.

Response to error detection

The error "Missing supply voltage L+" is detected, reported and ends the "pause" regardless of whether the pause status is adopted.

All channels which are set to "PE_MODE_PROCEED" and "PE_MODE_LAST_VALUE" in pause mode report errors as in productive operation.

The following conditions apply to all channels (ports) which switch to a different pause mode ("PE_MODE_SHUTDOWN" and "PE_MODE_SUBST_VALUE"):

- Switching off the supply voltage USn (port) at the start of "pause" does not result in the messages "Line break" or "Short circuit".
- Error detection is not possible during the "pause" (no IO-Link device communication):
  - Messages for errors already pending before the "pause" are retained.
  - After the "pause" is over, the error status is updated and incoming/outgoing errors are reported correspondingly.

Ending a "pause"

The pause is ended in the following cases:

- Failure of the supply voltage L+
- Re-assignment of the I/O module parameters
- "End_Pause" command
- Controller failure
- Firmware update
- Station stop
- Restart of the interface module

Mode parameter

Only the "Mode" parameter is shown below. The complete configuration can be found in the "Parameter assignment" chapter.

Table 1- 11 Mode parameter

Element	Coding	Explanation
Mode	0_D: PE_MODE_PROCEED	Proceed at "pause"
	1_D: PE_MODE_SHUTDOWN	Switch off at "pause" • Supply voltage USn (port) switched off[1] • Pause substitute value (input): 0_B
	3_D: PE_MODE_LAST_VALUE[2]	• Supply voltage USn (port) switched off • Last input and output value is maintained
	4_D: PE_MODE_SUBST_VALUE	see: 1_D: PE_MODE_SHUTDOWN

1 Supply voltage USn of the assigned port is switched off. Result: The IO-Link device fails.

2 With time-based IO, the IO-Link master behaves according to 1_D: PE_MODE_SHUTDOWN