



# ECS-PCIe/1100

Ether**CAT**<sup>®</sup>

Slave Interface for PCs



## Hardware Manual

to Product E.1100.01



## NOTE

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## Document History

The changes in the document listed below affect changes in the hardware as well as changes in the description of the facts, only.

Revision	Chapter	Changes versus previous version	Date
1.0	-	First English version	2011-06-04
1.1	-	EtherCAT logo added, EtherCAT trademark note revised	2012-05-07
	-	Safety Instructions revised	
	4.	LED labelling added in figure and table	
	5.3	Table name corrected	
	6.1.1	Chapter:" Permissible Cable Types" inserted	
	7.	Declaration of Conformity inserted	
	8.	Chapter moved and revised	

Technical details are subject to change without further notice.



## Safety Instructions

- When working with ECS-PCIe/1100 follow the instructions below and read the manual carefully to protect yourself from injury and the ECS-PCIe/1100 from damage.
- The device is a built-in component. It is essential to ensure that the device is mounted in a way that cannot lead to endangering or injury of persons or damage to objects.
- The device has to be securely installed in the control cabinet before commissioning.
- Protect the ECS-PCIe/1100 from dust, moisture and steam.
- Protect the ECS-PCIe/1100 from shocks and vibrations.
- The ECS-PCIe/1100 may become warm during normal use. Always allow adequate ventilation around the ECS-PCIe/1100 and use care when handling.
- Do not operate the ECS-PCIe/1100 adjacent to heat sources and do not expose it to unnecessary thermal radiation. Ensure an ambient temperature as specified in the technical data.
- Do not use damaged or defective cables to connect the ECS-PCIe/1100.
- In case of damages to the device, which might affect safety, appropriate and immediate measures must be taken, that exclude an endangerment of persons and objects.
- Current circuits which are connected to the device have to be sufficiently protected against hazardous voltage (SELV according to EN 60950-1).
- The ECS-PCIe/1100 may only be driven by power supply current circuits, that are contact protected. A power supply, that provides a safety extra-low voltage (SELV or PELV) according to EN 60950-1, complies with this conditions.



### Attention !

**Electrostatic discharges may cause damage to electronic components.**

To avoid this, please perform the steps described on page 8 *before* you touch the ECS-PCIe/1100, in order to discharge the static electricity from your body.

### Qualified Personal

This documentation is directed exclusively towards qualified personal in control and automation engineering. The installation and commissioning of the product may only be carried out by qualified personal, which is authorized to put devices, systems and electric circuits into operation according to the applicable national standards of safety engineering.

### Conformity

The ECS-PCIe/1100 meets the demands of the EU regulations and EMC standards printed in the conformity declaration at the end of this manual.

### Intended Use

The intended use of the ECS-PCIe/1100 is the operation as EtherCAT Slave interface for PCs. The guarantee given by esd does not cover damages which result from improper use, usage not in accordance with regulations or disregard of safety instructions and warnings.

- The ECS-PCIe/1100 is a PC board designed for the installation in PCI Express slots only.
- The operation of the ECS-PCIe/1100 in hazardous areas, or areas exposed to potentially explosive materials is not permitted.
- The operation of the ECS-PCIe/1100 for medical purposes is prohibited.

### Service Note

The ECS-PCIe/1100 does not contain any parts that require maintenance by the user. The ECS-PCIe/1100 does not require any manual configuration of the hardware.

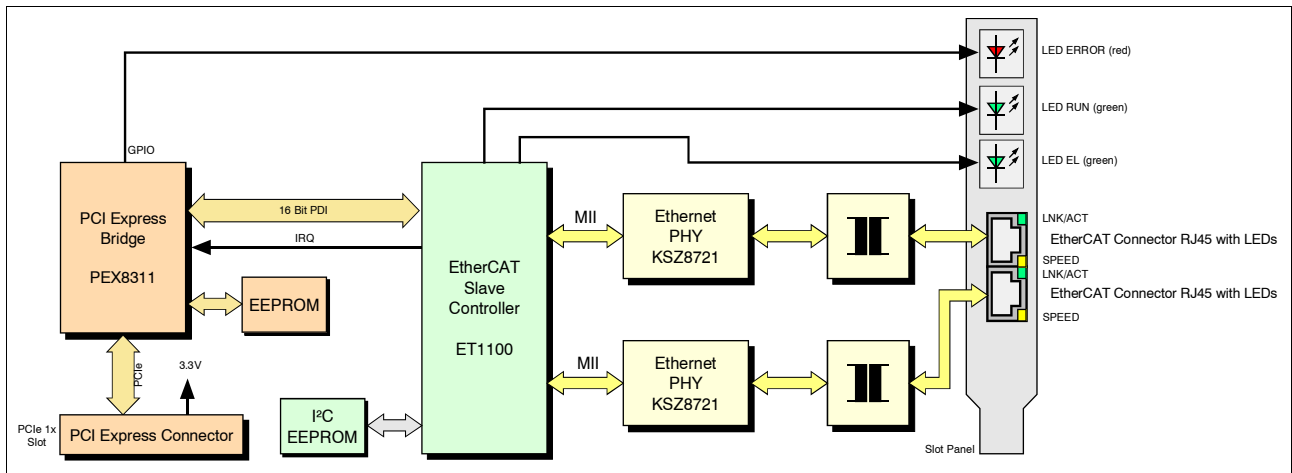
### Note on Environmental Protection

Devices which have become defective in the long run have to be disposed in an appropriate way or have to be returned to the manufacturer for proper disposal. Please, make a contribution to environmental protection.

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# 1. Overview



**Figure 1:** Block circuit diagram

The ECS-PCIe/1100 is a simple EtherCAT slave interface for PCs. The PC board is designed for PCI Express slots. It features an EtherCAT slave using the Ethernet physical layer via two RJ45 Ethernet sockets.

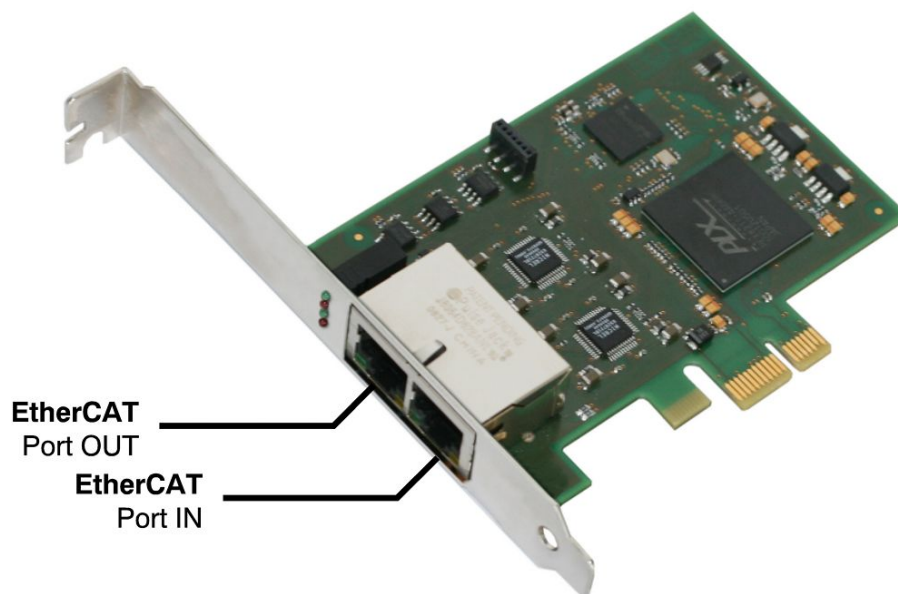
The board uses the ET1100 EtherCAT slave controller (ESC) ASIC that comes with 8 kBytes memory and 8 EtherCAT sync managers. The ET1100 ESC address space is directly mapped to the PCIe address space.

The ECS-PCIe/1100 integrates any PC into an EtherCAT network and makes it an EtherCAT slave node. The PC can act as I/O node. An EtherCAT master can use several EtherCAT protocols like CANopen over Ethernet (CoE), File over EtherCAT (FoE) and Ethernet over EtherCAT (EoE) to communicate with the PC.

Configuration is done by EtherCAT master. A sample device description file (XML) is provided.

The ECS-PCIe/1100 is an ideal starting point to product development with the esd EtherCAT Slave Stack (see chapter 5.4).

## 2. Connection Diagram



**Figure 2:** Connection Diagram of ECS-PCle/1100

See also page 13 for signal assignment of the connectors.

### 3. Hardware Installation



**Read the safety instructions at the beginning of this document carefully, before you start with the hardware installation!**



**Danger!**

Electric shock risk. Never carry out work while power supply voltage is switched on!



**Attention !**

**Electrostatic discharges may cause damage to electronic components.**

To avoid this, please perform the following steps *before* you touch the ECS-PCIe/1100, in order to discharge the static electricity from your body, :

- Switch off the power of your computer, but leave it connected to the mains until you have discharged yourself.
- Please touch the metal case of the computer now to discharge yourself.
- Furthermore, you should prevent your clothes from touching the computer, because your clothes might be electrostatically charged as well.

**Procedure:**

1. Switch off your computer and all connected peripheral devices (monitor, printer, etc.).
2. Discharge your body as described above.
3. Disconnect the computer from the mains.  
If the computer does not have a flexible mains cable, but is directly connected to mains, disconnect the power supply via the safety fuse and make sure that the fuse cannot switch on again unintentionally (i.e. with caution label).



**Danger!**

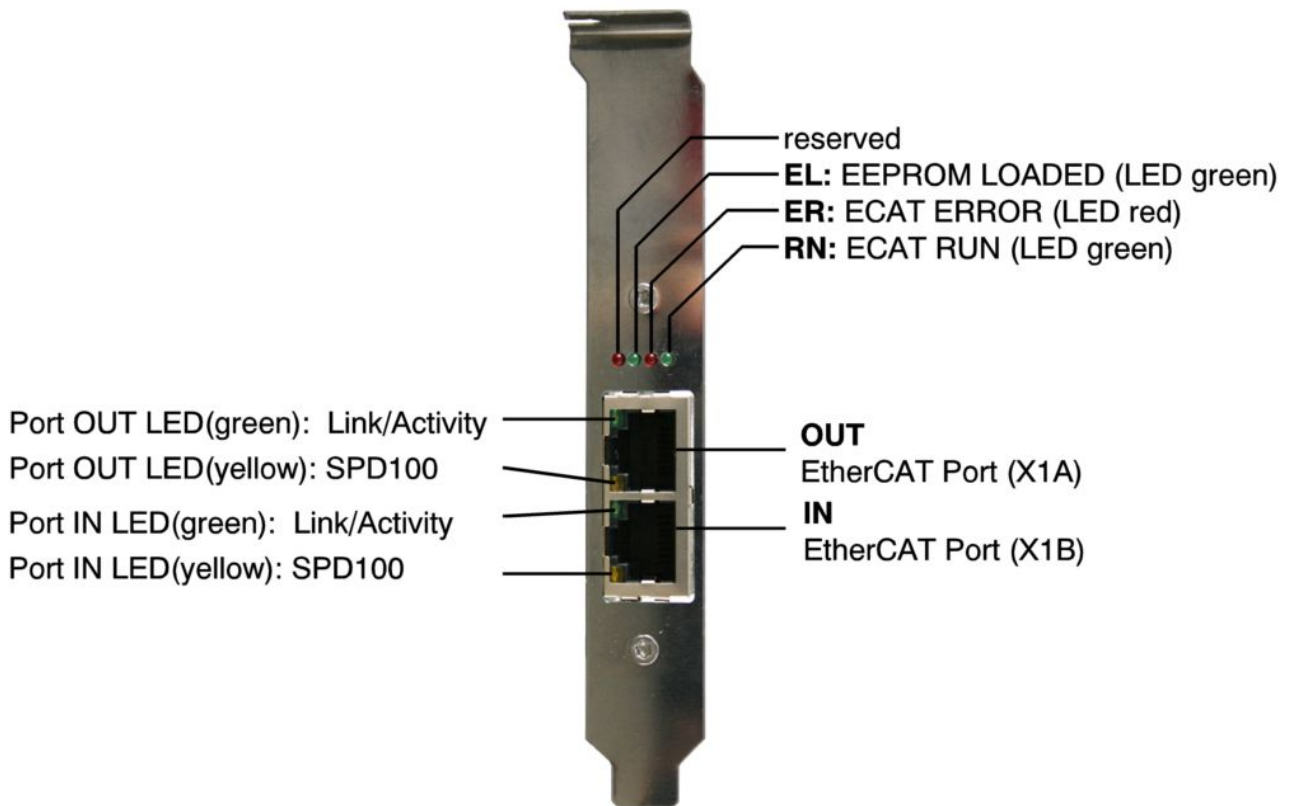
Never carry out work while power supply voltage is switched on!

4. Open the case.
5. Insert the ECS-PCIe/1100 board into the selected PCIe slot. Carefully push the board down until it snaps into place.
6. Close the computer case again.
7. Connect the EtherCAT interfaces via the connectors in the front panel of the ECS-PCIe/1100.
8. Connect the computer to mains again (mains connector or safety fuse).
9. Switch on the computer and the peripheral devices.
10. End of hardware installation.
11. Set the interface properties in your operating system. Refer to the documentation of the operating system.



## 4. LEDs

### 4.1 Front Panel View



**Figure 3:** Position of LEDs

### 4.2 LED Indication

#### Status LEDs

The ECS-PCle/1100 supports 4 status LEDs in the front panel (see figure 3).

Label	Name	Colour	Description
-	-	red	reserved for future use
EL	EEPROM LOADED	green	LED on, if EEPROM is completely loaded
ER	ECAT ERROR	red	indicates the error state, this LED is controlled by the EtherCAT Slave Stack (for further information see documentation of the EtherCAT Slave Stack)

## LEDs

Label	Name	Colour	Indicator States	Description
RN	ECAT RUN	green	<b>Off</b>	ECS-PCle/1100 is in state INIT
			<b>Blinking</b> (2.5 Hz on/off-frequency)	ECS-PCle/1100 is in state PRE-OPERATIONAL
			<b>Single Flash</b> (LED 200 ms on, 1000 ms off)	ECS-PCle/1100 is in state SAFE-OPERATIONAL
			<b>ON</b>	ECS-PCle/1100 is in state OPERATIONAL
			<b>Flickering</b> (10 Hz on/off-frequency)	ECS-PCle/1100 is booting and has not yet entered the INIT state, or is in state BOOTSTRAP. Firmware download operation in progress
			<b>Triple Flash</b> (LED 3x(200 ms on, 200 ms off) + 1x(1000 ms off))	Device Identification User can set this state from the master to locate the specific slave.

**Table 1:** Description of ECS-PCle/1100 Status LEDs

## EtherCAT LEDs

For each EtherCAT port (ECAT IN, ECAT OUT), there are an EtherCAT traffic LED (SPD100) and a Link/Activity LED, integrated in the corresponding RJ45 connector in the front panel of the ECS-PCle/1100 (see figure 3).

Name	Colour	Description	
Link/Activity	green	<b>On</b>	EtherCAT link of the port, without activity
		<b>Flickering</b>	EtherCAT link of the port and EtherCAT activity (reception of Ethernet data)
		<b>Off</b>	no EtherCAT link of the port
SPD100	yellow	<b>On</b>	100 MBit/s link
		<b>Off</b>	no valid link

**Table 2:** EtherCAT LEDs

## 5. Technical Data

### 5.1 General Technical Data

Power supply voltage	nominal voltage: 3.3 V via PCIe nominal current: tbd.
Connectors	OUT (8 pin RJ45 X1A) - EtherCAT Interface Port Out IN (8 pin RJ45 X1B) - EtherCAT Interface Port In
Temperature range	0...50 °C ambient temperature
Humidity	max. 90%, non-condensing
Dimensions	96 mm x 70 mm (low profile PCIe)
Weight	60 g

**Table 3:** General data of the module

### 5.2 EthetCAT® Interface

ESC ASIC	ET1100
Type	EtherCAT Slave
ESC interface	100BASE-TX according to IEEE 802.3, 100 Mbit/s, electrical isolation
Connector	2x RJ45

**Table 4:** EtherCAT

### 5.3 PCI Express Interface

PCIe Endpoint	PLX PEX8311
PCIe Port	according to PCI Express Specification R1.0a
Link width	1x
Connector	PCIe card edge connector

**Table 5:** PCI Express interface

### 5.4 Software Support

Device drivers for Windows and Linux are available. Drivers for other operating systems, especially real-time operating systems, are available on request.

Configuration is done by EtherCAT master. A sample device description file (XML) is provided.

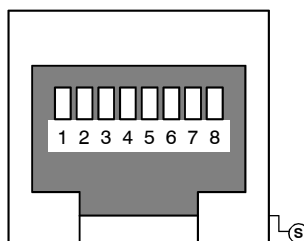
An EtherCAT Slave Stack is available. Please refer to the EtherCAT Slave Stack manual.

## 6. Interfaces and Connector Assignments

### 6.1 Connector Assignment RJ45

Both RJ45 connectors have the same pin-assignment, each for the corresponding EtherCAT port.

#### Pin Position:



#### Pin Assignment:

Pin	Port IN Signal	Port OUT Signal	Meaning
1	Tx0+ (TxD+)	Tx1+ (TxD+)	Transmit Data +
2	Tx0- (TxD-)	Tx1- (TxD-)	Transmit Data -
3	Rx0+ (RxD+)	Rx1+ (RxD+)	Receive Data +
4	-	-	-
5	-	-	-
6	Rx0- (RxD-)	Rx1- (RxD-)	Receive Data -
7	-	-	-
8	-	-	-
S	Shield	Shield	

#### Signal Description:

Tx0+/-, Rx0+/- ... EtherCAT data lines of port IN  
 Tx1+/-, Rx1+/- ... EtherCAT data lines of port OUT  
 - ... reserved for future applications, do not connect!  
 Shield... case shield, connected with the front panel of the ECS-PCIe/1100.

#### 6.1.1 Permissible Cable Types

Cables of category CAT5 or higher have to be used to grant the function in networks with up to 100 Mbit/s.

esd grants the EC conformity of the product, if the wiring is carried out with shielded twisted pair cables of class U/FTP or higher.

## 7. Declaration of Conformity

### EG-KONFORMITÄTSERKLÄRUNG EC DECLARATION OF CONFORMITY



Adresse **esd electronic system design gmbh**  
Address **Vahrenwalder Str. 207**  
**30165 Hannover**  
**Germany**

esd erklärt, dass das Produkt  
*esd declares, that the product*  
**ECS-PCIe/1100**

Typ, Modell, Artikel-Nr.  
*Type, Model, Article No.*  
**E.1100.02**

die Anforderungen der Normen  
*fulfills the requirements of the standards*

**EN 61000-6-2:2005,**  
**EN 61000-6-3:2007 + A1:2011**

gemäß folgendem Prüfbericht erfüllt.  
*according to test certificate.*

**H-K00-0454-11**

Das Produkt entspricht damit der EG-Richtlinie „EMV“  
*Therefore the product corresponds to the EC-Directive 'EMC'*

**2004/108/EG**

Das Produkt entspricht der EG-Richtlinie „RoHS“  
*The product corresponds to the EC-Directive 'RoHS'*

**2011/65/EU**

Diese Erklärung verliert ihre Gültigkeit, wenn das Produkt nicht den Herstellerunterlagen entsprechend eingesetzt und betrieben wird, oder das Produkt abweichend modifiziert wird.  
*This declaration loses its validity if the product is not used or run according to the manufacturer's documentation or if non-compliant modifications are made.*

Name / Name T. Ramm  
Funktion / Title CE-Koordinator / CE Coordinator  
Datum / Date Hannover, 2011-12-14

A handwritten signature in blue ink that reads 'Thorsten Ramm'.

Rechtsgültige Unterschrift / authorized signature

## 8. Order Information

Type	Properties	Order No.
ECS-PCIe/1100	PCI Express board with EtherCAT slave controller ET1100	E.1100.02
<b>Software Drivers</b>		
For detailed information about the driver availability for your operating system, please contact our sales team.		

**Table 6:** Order information

### PDF Manuals

Manuals are available in English and usually in German as well. For availability of English manuals see table below.

Please download the manuals as PDF documents from our esd website [www.esd.eu](http://www.esd.eu) for free.

Manuals		Order No.
ECS-PCIe/1100-ME	Hardware manual in English	E.1100.21

**Table 7:** Available manuals

### Printed Manuals

If you need a printout of the manual additionally, please contact our sales team: [sales@esd.eu](mailto:sales@esd.eu) for a quotation. Printed manuals may be ordered for a fee.