

# **OPTOIN-PCIe32 STANDARD**

**EDP No.: A-844600**

32 optocoupler isolated digital inputs

**wasco<sup>®</sup>**

user's guide

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## 1. Description

The **wasco**<sup>®</sup> interface card OPTOIN-PCle32<sub>STANDARD</sub> provides 32 digital input channels with galvanic isolation. Potential isolation is achieved by bipolar optocouplers of high quality. Each input is fitted with additional protection diodes against harmful voltage peaks and pulses. Easily pluggable jumpers enable to adjust two different voltage ranges for each single input channel.

The Optocoupler inputs are connected to a 68-pin SCSI socket on the board. The pin assignment is identical to the PCI bus card OPTOIN-PCI32<sub>STANDARD</sub>. Thus a switch to PCIe is easy to realize.

Furthermore the card provides a jumper block for a board identification. This enables you to differentiate between several identical cards in your system.

## 2. Installation of the OPTOIN-PCIe32<sub>STANDARD</sub>

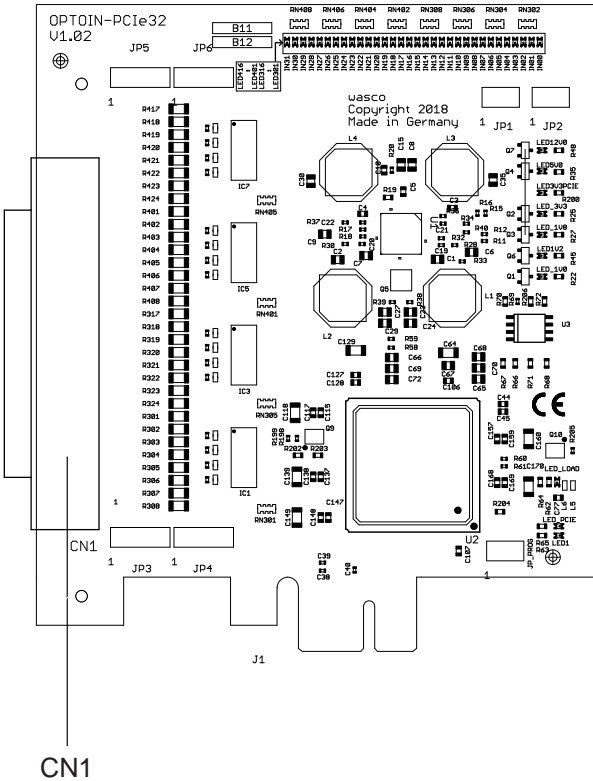
### 2.1 Installing the Card into your Computer

Before you insert the card unplug the power cord or make sure, there is no current to/in the computer. Inserting into a running system may cause damaging or destroying not only the OPTOIN-PCIe32<sub>STANDARD</sub>, but even other already inserted cards of your computer.

Select an empty PCIe slot of your computer for inserting the card. Please refer to the computer's manual for support. Secure the OPTOIN-PCIe32 by screwing the slot bracket to the casing of your computer to avoid a card's loosening by effects of the connection cables.

# 3. Connectors

## 3.1 Position of the Connector Plugs



CN1: Optocoupler Inputs IN00...IN31

### 3.2 Pin Assignment of CN1

GND	68 □ □ 34	Vcc
GND	67 □ □ 33	Vcc
IN31-	66 □ □ 32	IN31+
IN30-	65 □ □ 31	IN30+
IN29-	64 □ □ 30	IN29+
IN28-	63 □ □ 29	IN28+
IN27-	62 □ □ 28	IN27+
IN26-	61 □ □ 27	IN26+
IN25-	60 □ □ 26	IN25+
IN24-	59 □ □ 25	IN24+
IN23-	58 □ □ 24	IN23+
IN22-	57 □ □ 23	IN22+
IN21-	56 □ □ 22	IN21+
IN20-	55 □ □ 21	IN20+
IN19-	54 □ □ 20	IN19+
IN18-	53 □ □ 19	IN18+
IN17-	52 □ □ 18	IN17+
IN16-	51 □ □ 17	IN16+
IN15-	50 □ □ 16	IN15+
IN14-	49 □ □ 15	IN14+
IN13-	48 □ □ 14	IN13+
IN12-	47 □ □ 13	IN12+
IN11-	46 □ □ 12	IN11+
IN10-	45 □ □ 11	IN10+
IN09-	44 □ □ 10	IN09+
IN08-	43 □ □ 9	IN08+
IN07-	42 □ □ 8	IN07+
IN06-	41 □ □ 7	IN06+
IN05-	40 □ □ 6	IN05+
IN04-	39 □ □ 5	IN04+
IN03-	38 □ □ 4	IN03+
IN02-	37 □ □ 3	IN02+
IN01-	36 □ □ 2	IN01+
IN00-	35 □ □ 1	IN00+

**Vcc:**

Connector for internal voltage source (+ 5V) (a wiring bridge must be soldered on B11),  
**Never apply an external voltage across this pin.**

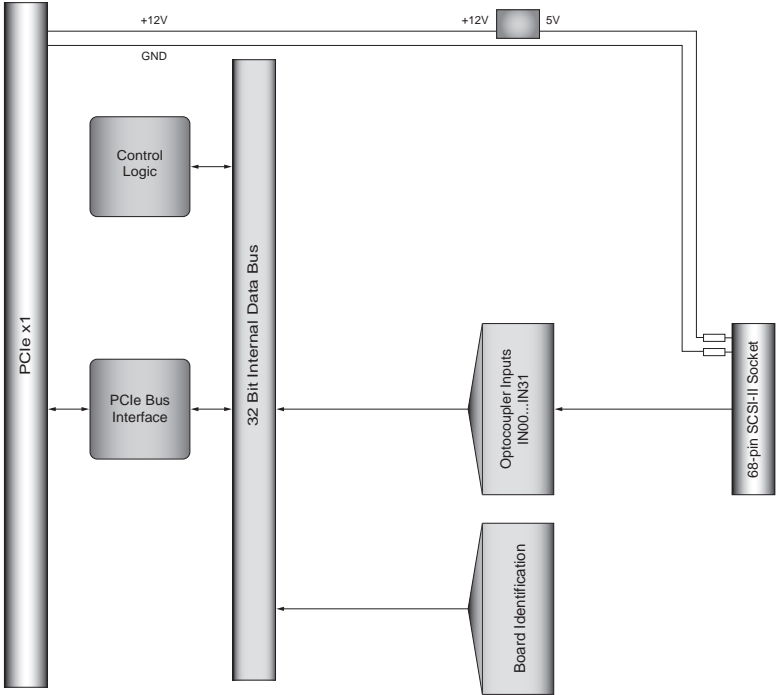
**GND:**

Ground connection (only when a wiring bridge is soldered on B12).



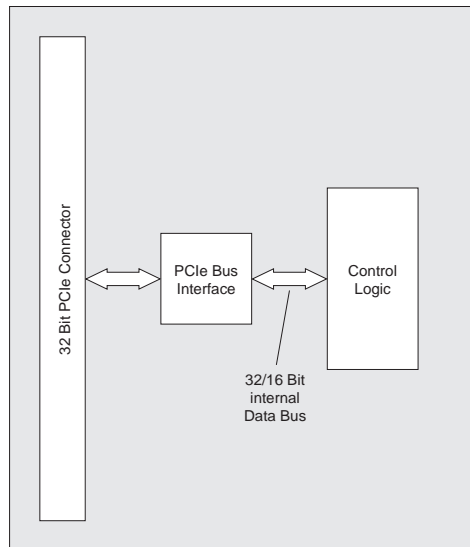
# 4. System Components

## 4.1 Block Diagram



## 4.2 Access to the System Components

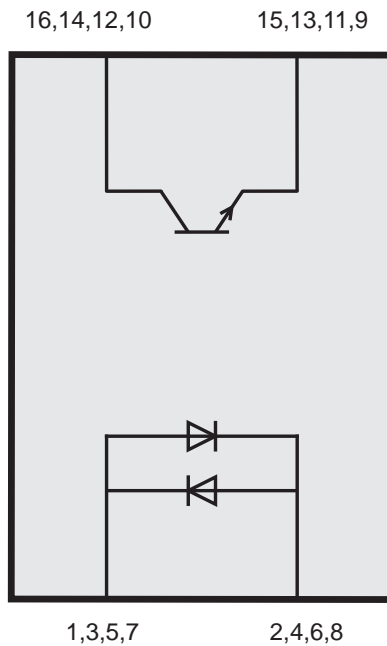
Access to the hardware components of the OPTOIN-PCle32 is made by reading or writing to Memory Mapped I/O addresses by means of library functions. The addresses relevant for OPTOIN-PCle32 depend on a base address assigned by the BIOS. You can access to the OPTOIN-PCle32 by double word access only. For reasons of compatibility the wasco drivers process or take into account the two least significant bytes only. (Please find more information in the chapter Programming or in the example programs on the enclosed CD)



## 5. 32 Optocoupler Isolated Digital Inputs

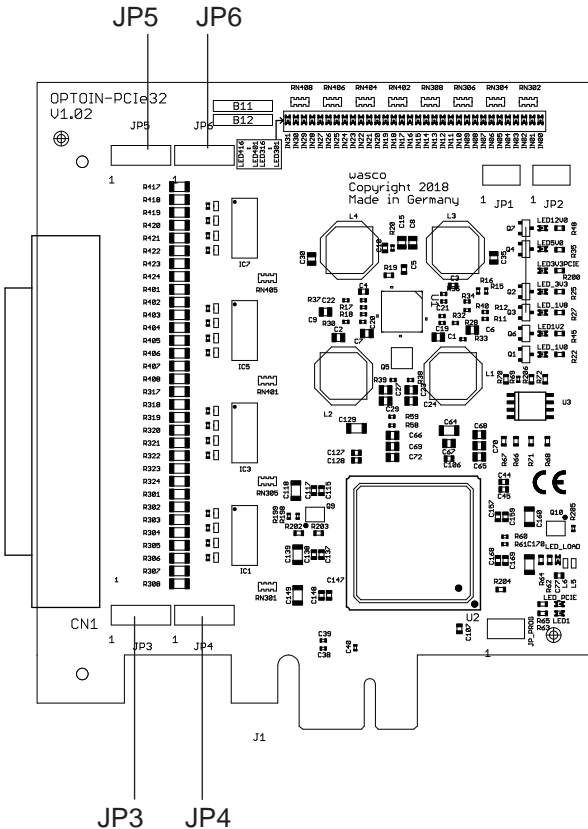
Die OPTOIN-PCIe32<sub>STANDARD</sub> provides 32 input channels which are optically isolated by optocouplers.

### 5.1 Pin Assignment of the Input Optocouplers



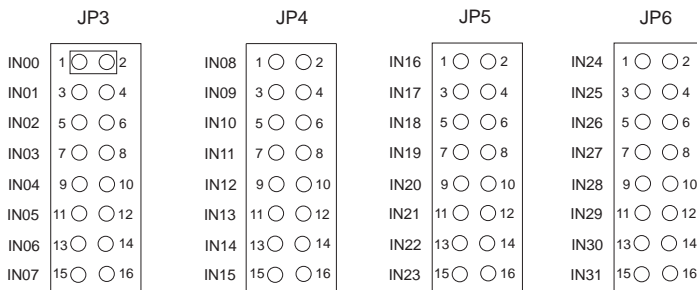
## 5.2 Input Voltage Ranges

You can select two different input voltage ranges for each optocoupler input by setting jumpers JP3, JP4, JP5 and JP6



Following table shows the data of the two input voltage ranges:

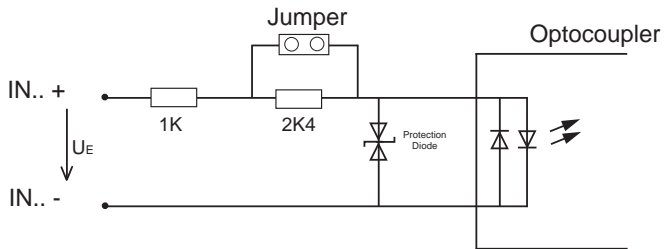
Jumper	low	high
closed	0...1 V	5...15 V
off	0...2 V	14...30 V



**Example:**

Setting the jumper over Pin1 and Pin2 of the jumper block JP3 the input voltage range of IN00 switches from 0..2V (Low) and 14..30V (High) to 0..1V (Low) and 5..15V (High). The remaining input voltage ranges keep unaffected.

### 5.3 Input circuitry



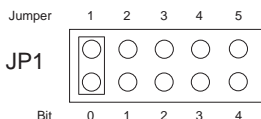
### 5.4 Input current

$$I_E \approx \frac{U_E - 1,1V}{3400\Omega} \quad (\text{Jumper off})$$

$$I_E \approx \frac{U_E - 1,1V}{1000\Omega} \quad (\text{Jumper closed})$$

## 6. Board Identification

### 6.1 Board identification



The board Identification enables you to differentiate between several PC boards of the same type in your system. This is realised by a software readable jumper block.

The board identification to be read consists of one Byte (8 Bit) and is structured as follows:

Bit	31	..	..	8	7	6	5	4	3	2	1	0
Jumper								5	4	3	2	1
Board ID Register	0	0	0	0	0	0	0	x	x	x	x	x

„x“ corresponds to „1“, if the Jumper is closed, otherwise „0“

Calling the reading command you can read out the setting of the jumper block JP1. Not used bits are basically „0“, a set or closed jumper will be read as „1“.

For example:



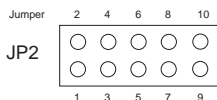
Result of the reading command: \$05

## 6.2 Access via 16 or 32 bit

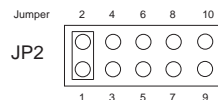
The jumper block JP2/1-2 can be used to set the access width. If the jumper block JP2/1-2 is not set (default), the card operates in compatibility mode. In this mode, the card is accessed in 16-bit mode. Furthermore, the offset addresses of the card OPTOIN-PCI32<sub>STANDARD</sub> are effective with factor 2.

If the jumper is set, the card operates in 32-bit mode and therefore is fully compatible with other PCIe cards in offset addressing.

The offset addresses of both of the modi are covered in chapter 7.5 „Assignment of the Memory Mapped I/O Addresses“



16-Bit mode



32-Bit mode



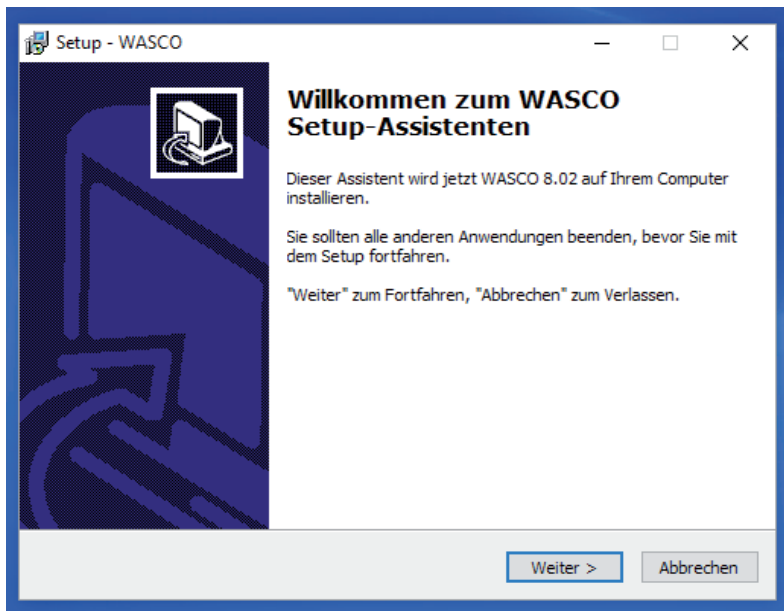
## 7. Programming under Windows<sup>®</sup>

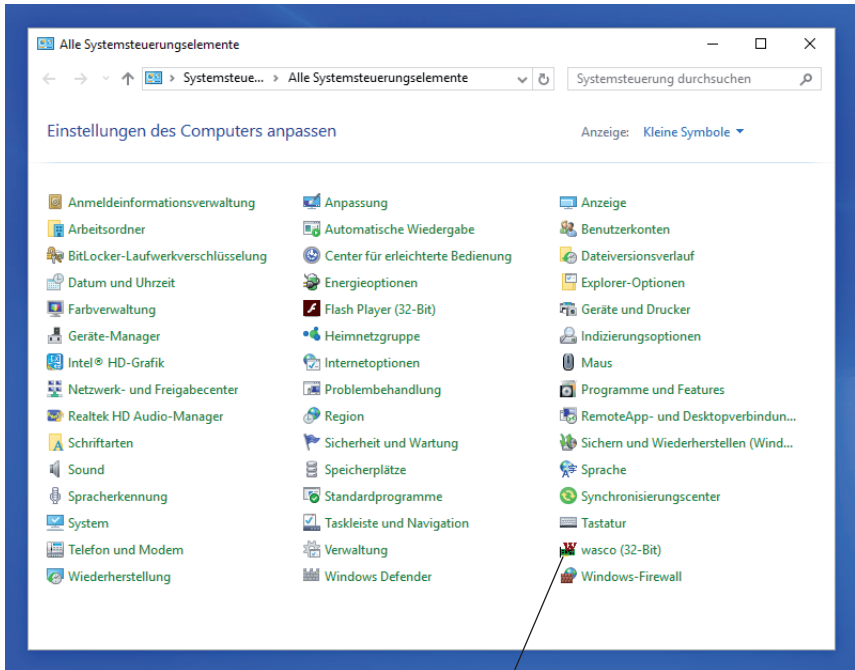
### 7.1 Installing the Windows<sup>®</sup> driver

In order to implement the card under Windows<sup>®</sup>, it is necessary to install a special driver, which allows access to the card. The operating system under Windows<sup>®</sup> 10, 8 and 7 automatically reports after starting the PC, that a new hardware component has been found. In this case, insert the data medium and instruct the system to install the driver files herefrom. If the operating system does not respond, the driver also can be installed in the Device Manager.

### 7.2 Installing the Windows<sup>®</sup> development files

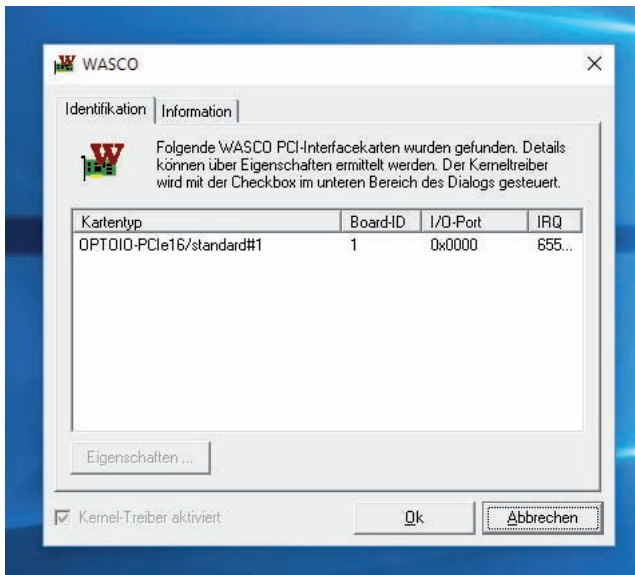
For installation of the development files, please run the „Setup.exe“ file in the folder driver on the accompanying CD and follow the installation instructions.





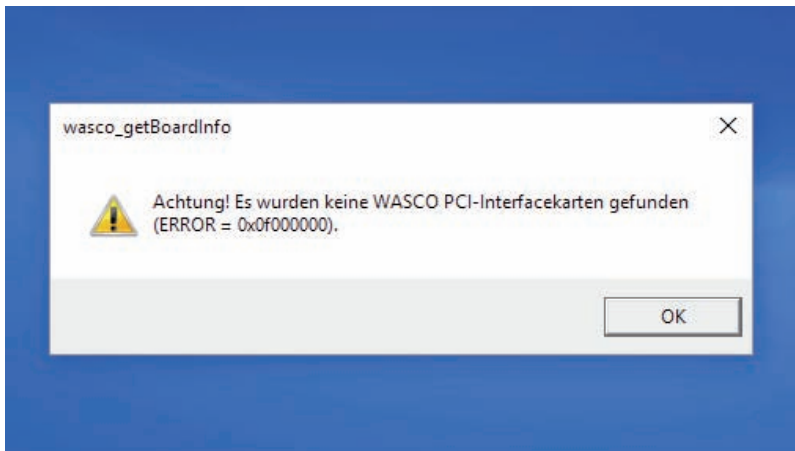
Once the driver and development files have been installed completely, you will find an icon in the control panel of your computer to localize all **wasco®** PCI and PCIe cards existing in the system.

Start the card query by double-clicking the „wasco®“ icon. Following window appears: (An OPTOIO-PCIe16STANDARD is used as an example)



If your card has been detected in the system, the board name, the Board-ID, the I/O address as well as the possible interrupt number of the respective card are displayed in this window. Furthermore, the driver version and the location of the driver file can be queried via the „Information“ tab.

If your card was not detected, following error message will be displayed:



Please find more about the possible causes in the chapter Troubleshooting.

### 7.3 Programming the OPTOIN-PCIe32 with **wasco**® driver

After installation of the development files of Kithara by means of the setup program the folder **wasco** contains of the relevant development files and the sample programs. Further sample programs specified for access to the OPTOIO-PCIe32 you can find on the enclosed CD or please visit our homepage.

Programming the hardware components of the OPTOIN-PCIe32 is realized by access to Memory Mapped I/O addresses which depend on the base address assigned by the system's BIOS for the OPTOIN-PCIe32. Find a more detailed description for programming in the driver documentation.

#### 7.4 Access to the card OPTOIN-PCIe32<sub>Standard</sub>

The access to the OPTOIN-PCIe32<sub>Standard</sub> is done exclusively via board name (card type) WASCO-PCIe8213

#### 7.5 Assignment of the Memory Mapped I/O Addresses

The Memory Mapped I/O addresses of the individual hardware components depend on the base address as follows:

##### 16-bit mode

Port/Register	BA + Offset	RD/WR
Optocoupler Input Port A (IN00...IN16)	BA + \$0	RD
Optocoupler Input Port B (IN16...IN31)	BA + \$4	RD
Board Identification	BA+ \$3E0	RD

##### 32-bit mode

Port/Register	BA + Offset	RD/WR
Optocoupler Input Port A (IN00...IN31)	BA + \$0	RD
Board Identification	BA+ \$FF8	RD

Attention! The driver's offset constants work directly only for the PCI cards. We recommend using the offsets instead of the constants when programming.

## 7.6 Compatibility to the OPTOIN-PCI32<sub>STANDARD</sub>

Developing the OPTOIN-PCIe32<sub>STANDARD</sub> and its drivers special regard was attended to use identical accesses as to the OPTOIN-PCI32<sub>STANDARD</sub>. This enables you to change over from PCI to PCIe with existing programs in a very easy way. The driver (as from version 8.02) can be used for both PCI and PCIe.

What has been changed and what has to be changed respectively for the PCIe board:

1. The board's name is no longer „OPTOIN-PCI32<sub>STANDARD</sub>“ but „WASCO-PCIe8213“
2. The functions to access to the port addresses for the PCIe board are given as „wasco\_outputPCIeW“ and „wasco\_inputPCIeW“
3. The offsets to access to the Memory Mapped I/O addresses have changed. The old offsets have to be multiplied by two for the PCIe card. (Unchanged Constants are usable for PCI only).
4. The setting of jumper block JP1 can be monitored via an additional address. The jumper can be used for example for the identification of the OPTOIN-PCIe32<sub>STANDARD</sub> when using several cards in the PC.

## 8. Programming under Linux<sup>®</sup>

For using the card under Linux<sup>®</sup>, an Linux wasco<sup>®</sup> driver is provided on the accompanying CD or our website. This is available in code form and can be changed and customized by the user at any time.

### 8.1 Installing the Linux<sup>®</sup> driver

To access the card under Linux<sup>®</sup>, a special driver is required to be installed. In this purpose, insert the data medium and copy the folder of the Linux driver to your system. To install the driver, follow the instructions in the readme file

### 8.2 Supported Linux distributions/kernel versions

The wasco<sup>®</sup> driver has been tested in the following environments:

Ubuntu<sup>®</sup> 18.04.4 LTS (Kernel: 5.3.0)

### 8.3 Programming of the OPTOIN-PCIe32 with **wasco**<sup>®</sup> driver

The programming of the hardware components of the OPTOIN-PCIe32 is done by accessing the Memory Mapped I/O addresses, which depend on the base address assigned by the system's BIOS for the OPTOIN-PCIe32.

The functions `pread` und `pwrite` are used for the access. Using the programming languages C und C/C++, no further external libraries are required. Examples for the exact access to the OPTOIN-PCIe32 can be found on the accompanying CD or on our homepage.

#### 8.4 Access to the card OPTOIN-PCIe32<sub>Standard</sub>

The access to the OPTOIN-PCIe32<sub>Standard</sub> is done exclusively via board name (card type) WASCO-PCIe8213.

#### 8.5 Assignment of the Memory Mapped I/O addresses

The Memory Mapped I/O addresses of the individual hardware components depend on the base address as follows

##### 32-Bit-Modus

Port/Register	BA + Offset	RD/WR
Optocoupler Input Port A (IN00...IN31)	BA + \$0	RD
Board Identification	BA+ \$FF8	RD

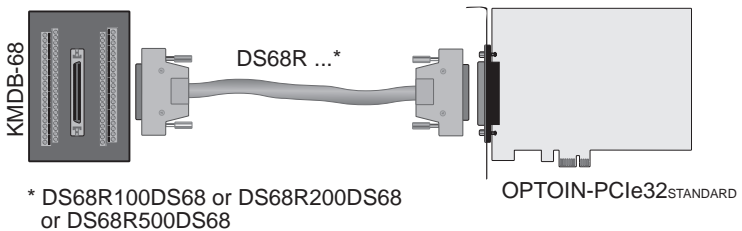


## 9. Accessories

### 9.1 Matching **wasco**<sup>®</sup> accessories

Connecting parts	EDP-No.
KMDB-68 Terminal Module	A-494800
DS68R100DS68 Connecting wire (1 meter)	A-492200
DS68R200DS68 Connecting wire (2 meter)	A-492400
DS68R500DS68 Connecting wire (5 meter)	A-492800

### 9.2 Connection Technique (application examples)



### 9.3 Single components for customized assembly

<b>Connection parts</b>	<b>EDP-No.</b>
SCSI-II plug 68-pin for flat ribbon cable	A-553200
SCSI-II socket 68-pin for flat ribbon cable	A-557200
Slot bracket with cutout for 68-pin connector male/female	A-577800
Flat ribbon cable 68-pin	A-572800
SCSI-II plug 68-pin für round cables	A-555340

## 10. Troubleshooting

Following you can find a brief compilation of the most common known causes of errors that may occur during starting-up or while running the OPTOIN-PCIe32.

Please firstly check the following points before you contact your dealer or distributor:

- 1st            Is OPTOIN-PCIe32 properly inserted to the connector ?
- 2nd            Are all cable connections in good order?
- 3rd            Did your system detect the card correctly?  
Please check all settings of your computer or contact your system administrator. (As this are BIOS settings of the computer we cannot expand on this issue. We refer to your systems manual.)
- 4th            Did you install the latest driver version for the **wasco**<sup>®</sup> drivers?  
Updates you can find here:    <http://www.messcomp.com>

## 11. Specifications

### Optocoupler Inputs

Optocouplers LTV-244 or compatible

32 channels, optically isolated

Galvanic isolation even between every single channel with each two separate connectors

Overvoltage protection by protection diodes

Two different input voltage ranges selectable by jumpers:

Range 1 high = 14..30 Volt

low = 0..2 Volt

Range 2: high = 5..15 Volt

low = 0..1 Volt

Input frequency: ma. 10 kHz

### Board Identification

Jumper block with five pairs of contact pins

### Connection plug

1 \* 68-pin SCSI socket

### Bus system

32-bit PCIe Bus (16 or 32 bit data access)

### Measurements of the Board

94 mm x 111 mm (l x b)

standard height, full length card

6- layer multilayer PCB

### Other

Control LEDs for power supply

## 12. Product Liability Act

### Information about Product Liability

The Product Liability Act (Act on Liability for Defective Products - Prod-HaftG) in Germany regulates the manufacturer's liability for damages caused by defective products.

The obligation to pay compensation can be given, if the product's presentation could cause a misconception of safety to a non-commercial end-user and also if the end-user is expected not to observe the necessary safety instructions handling this product.

It must therefore always be verifiable, that the non-commercial end-user was made familiar with the safety rules.

In the interest of safety, please always advise your non-commercial customer of the following safety instructions:

### Safety instructions

The valid VDE-instructions must be observed, when handling products that come in contact with electrical voltage.

Especially the following instructions must be observed:  
VDE100; VDE0550/0551; VDE0700; VDE0711; VDE0860.

The instructions are available from:  
Vde-Verlag GmbH  
Bismarckstr. 33  
10625 Berlin

- \* unplug the power plug before you open the unit or make sure, there is no current to/in the unit.
- \* You only may put into operation any components, boards or devices if they have been installed inside a secure touch-protected casing before. During installation there must be no current to the equipment.
- \* Make sure that the device is disconnected from the power supply before using any tools on any components, boards or equipment. Any electric charges stored in components in the device are to be discharged prior.
- \* Live cables or wires, which are connected with the unit, the components or the boards, must be tested for insulation defects or breaks. In case of any defect the device must be immediately taken out of operation until the defective cables have been replaced.
- \* When using components or boards you must strictly comply with the characteristic data for electrical sizes shown in the related description
- \* As a non-commercial end-user, if it is not clear whether or not the electrical characteristic data given in the provided description apply to a component you must consult an expert.

Furthermore, the compliance with building and safety instructions of all kinds (VDE, TÜV, industrial injuries corporation, etc.) is subject to the user/customer.

## 13. CE Confirmation

This is to certify, that the product

**OPTOIN-PCIe32<sup>STANDARD</sup>**  
**EDP number A-844600**

comply with the requirements of the relevant EMC directives 2014/30/EU. This declaration will lose its validity, if the instructions given in this manual for the intended use of the products are not fully complied with.

Following standards are regarded:

EN 55011: 2009 + A1. 2010 (Group 1, Class A)

EN 55022: 2010 / AC: 2011

EN 55024: 2010

EN 61000-6-4: 2007 + A1: 2011

EN 61000-6-2: 2005 / AC: 2005

(EN 6100-4-2: 2008; EN 6100-4-3: 2006 + A1: 2007 + A2; EN 6100-4-4: 2012;  
EN 6100-4-5: 2014; EN 6100-4-6: 2013; EN 6100-4-8: 2009; EN 6100-4-11: 2004)

The following manufacturer is responsible for this declaration:

Messcomp Datentechnik GmbH  
Neudecker Str. 11  
83512 Wasserburg

given by

Dipl.Ing.(FH) Hans Schnellhammer

Wasserburg, 19.03.2019



**Reference system for intended use**

This PC expansion card is not a stand-alone device. The CE-conformity only can be assessed when additional computer components are in use simultaneously. Thus the CE conformity only can be confirmed when using the following reference system for the intended use of the PC expansion card:

Control Cabinet:	Vero IMRAK 3400	804-530061C 802-563424J 802-561589J
19" Casing:	Vero PC Casing	145-010108L
19" Casing:	additional Electronic	519-112111C
Motherboard:	ASUS P5G41-M LE	
Interface:	OPTOIN-PCIe32 <sub>STANDARD</sub>	A-844600