OPTOPRE-PCIe8
STANDARD

EDP No.: A-823600

8 Optocoupler Isolated Digital Inputs
8 Relay Outputs

wasco®

user‘s guide

wasco®

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wasco®

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1. Description

The **wasco**® interface board OPTOPRE-PCIe8STANDARD features eight digital input channels and eight digital output channels, each of which are galvanically isolated individually. Inputs are electrically isolated by high-quality optocouplers, the outputs by eight relays. The input optocouplers are bipolar. Additionally the inputs are protected against harmful voltage peaks by protection diodes.
You easily can adjust two different input voltage ranges by setting jumpers.
The output relays cope with a switching current of max. 2 A.
The connections of the optocouplers and the relay signals are connected to a 37-pin Sub-D female socket on the slot bracket of the board.
The pin assignment and the input voltage ranges of the optocoupler inputs are identical to PCI bus card OPTOPRE-PCI8STANDARD, a switch to PCIe is therefore easy to implement.
Furthermore, the card comes with a jumper block for card identification in order to distinguish several identical cards in the computer.

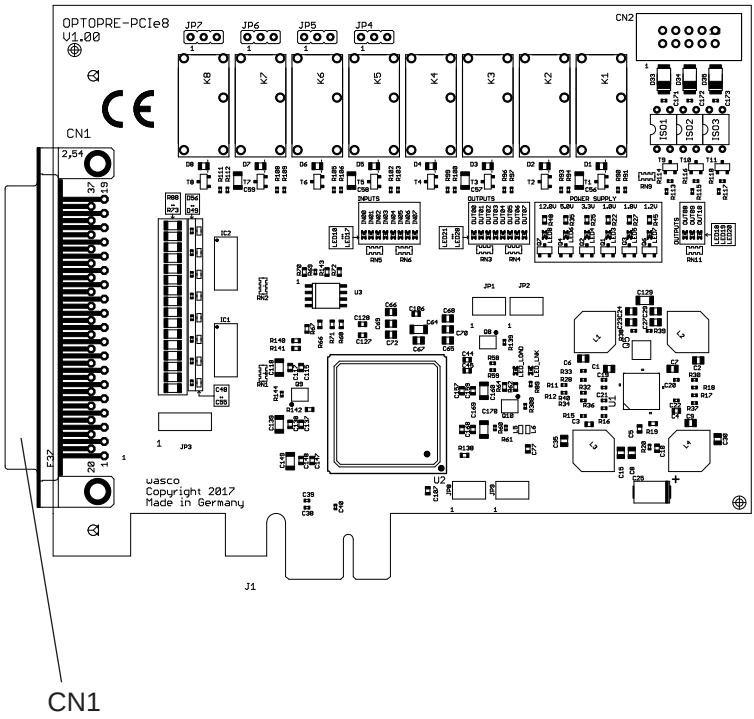
2. Installation of the OPTOPRE-PCIe8STANDARD

2.1 Installation of the card into your system

Before you insert the OPTOPRE-PCIe8 unplug the power cord or make sure, there is no current to/in the computer. Inserting the interface card in a running system may cause damaging or destroying not only the card OPTOPRE-PCIe8, but even other already inserted cards of your computer.
Choose an empty PCIe slot of your computer for then inserting the card. Please refer to the computer‘s manual for support. Secure the circuit board by screwing the slot bracket to the casing of the computer to prevent the card from coming loose by effects of the connecting cables.

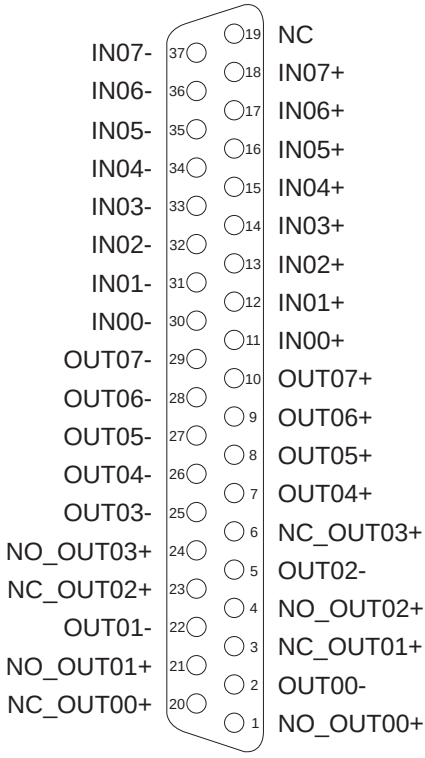
3. Connectors

3.1 Position of Connectors on the Board



CN1:
Optocoupler input channels IN00...IN07, relay outputs OUT00...OUT07

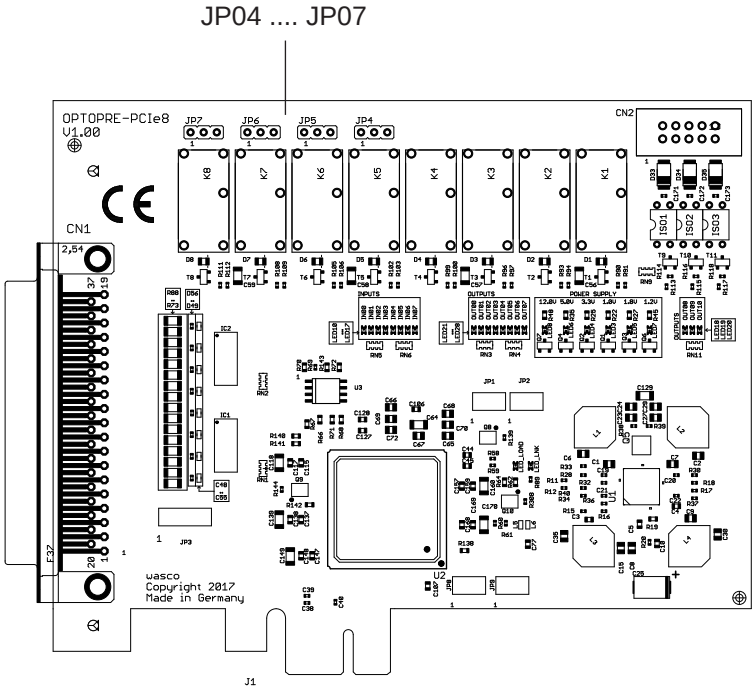
3.2 Pin Assignment of CN1



NO = Normal Open
NC = Normal Close

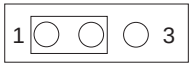
4. Jumper blocks

4.1 Position of the Jumper Blocks on the Board

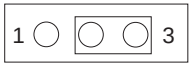


JP04...JP07:
Wiring of the print relay outputs OUT04...OUT07 (NO or NC contacts)

4.2 Jumper Block Assignment JP04...JP07



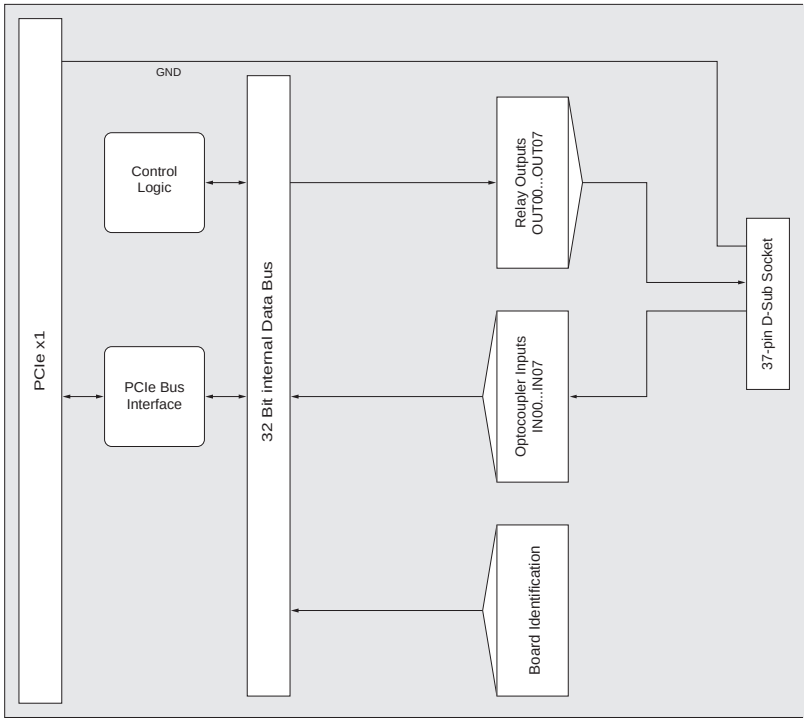
Relay contact configured as
normally closed contact (NCC)



Relay contact configured as
normally open contact (NOC)

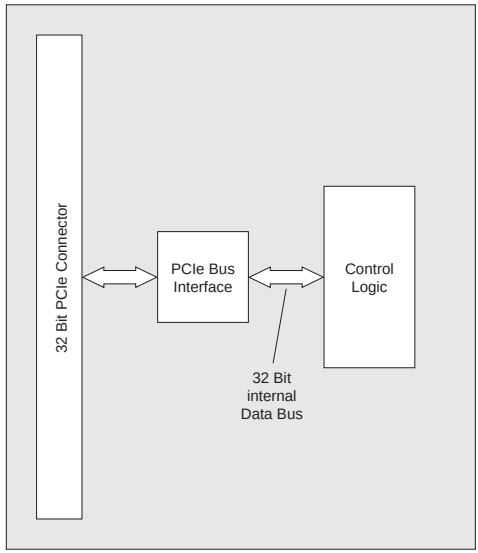
5. System Components

5.1 Block Diagram



5.2 Access to the system components

You can access to the hardware components of the OPTOPRE-PCIe8 by reading from or writing to Memory Mapped I/O addresses using library functions. The addresses relevant to the OPTOPRE-PCIe8 result from a base address assigned by the BIOS. Access to the OPTOPRE-PCIe8 is exclusively in double-word access. For reasons of compatibility the wasco driver functions only process or allow for the least significant byte.
(You will find more information in the chapter Programming as well as in the sample programs on the supplied CD)



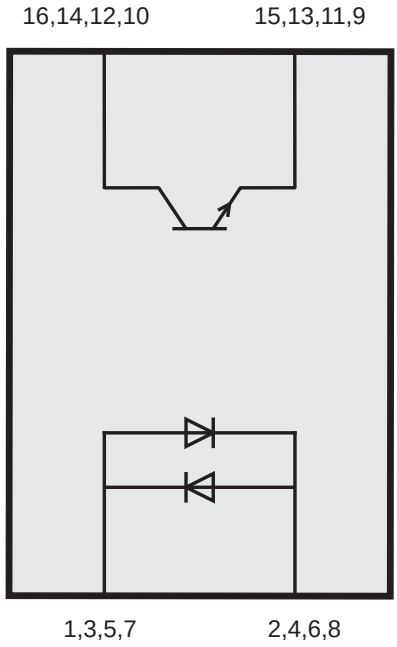
5.3 Power supply

To monitor the various operating voltages, there are six control LEDs on the circuit board.

6. 8 Optocoupler Isolated Digital Inputs

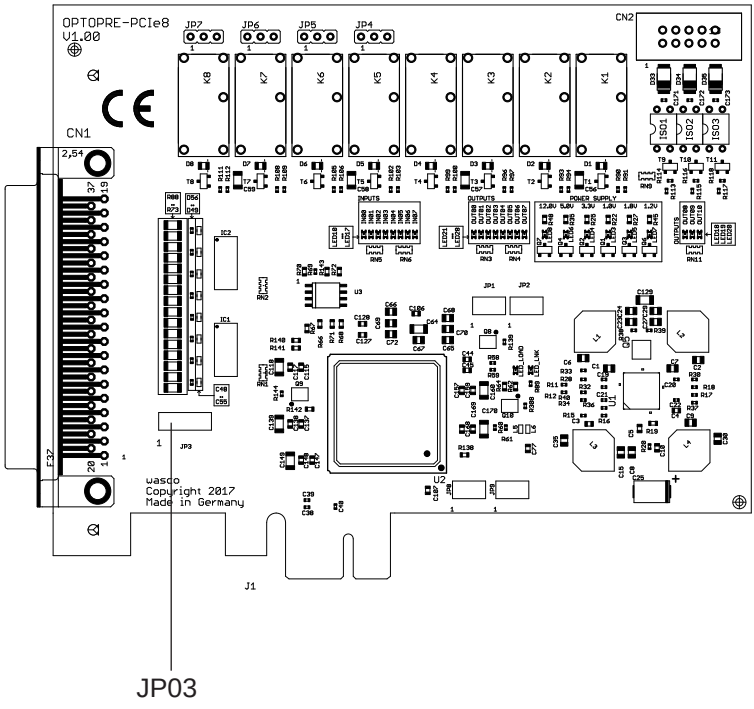
The OPTOPRE-PCIe8 provides 8 input channels, each of which is optically isolated by optocouplers. The isolation voltage between GND and input is 500 V_{DC}. The voltage within the input channels is limited to 100 Volt. The optocouplers are bipolar.

6.1 Pin assignment of the input optocouplers



6.2 Input voltage ranges

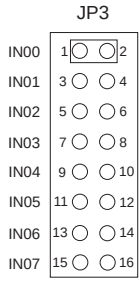
You can choose between two input voltage ranges for each optocoupler input by setting jumpers on block JP3.



JP03

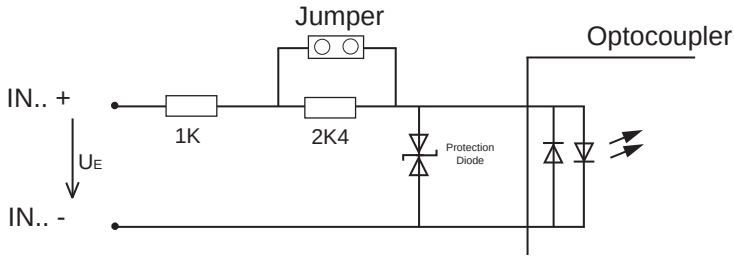
For the data of the two input voltage ranges, please see the following table:

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



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

6.3 Input wiring



6.4 Input current

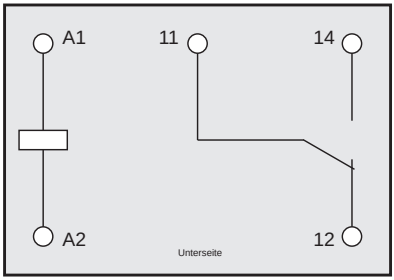
$$I_E \approx \frac{U_E - 1{,}1V}{3400\Omega} \qquad \text{(Jumper open)}$$

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

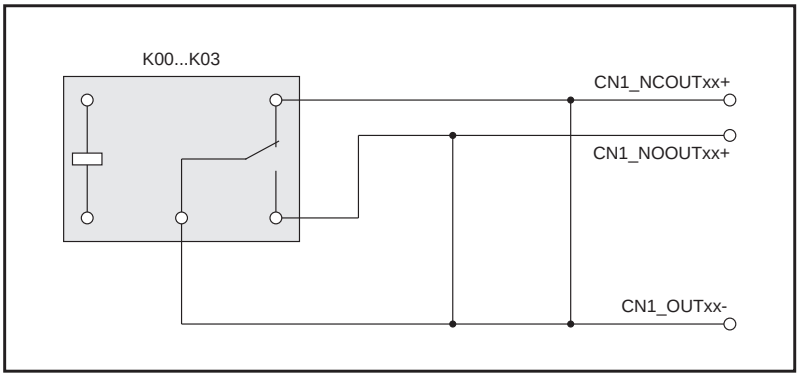
7. 8 Relay Outputs

The OPTOPRE-PCIe8 provides eight output channels, galvanically isolated by eight relays (8 * changer). The relay contacts are usable both as a NO contact and a NC contact.

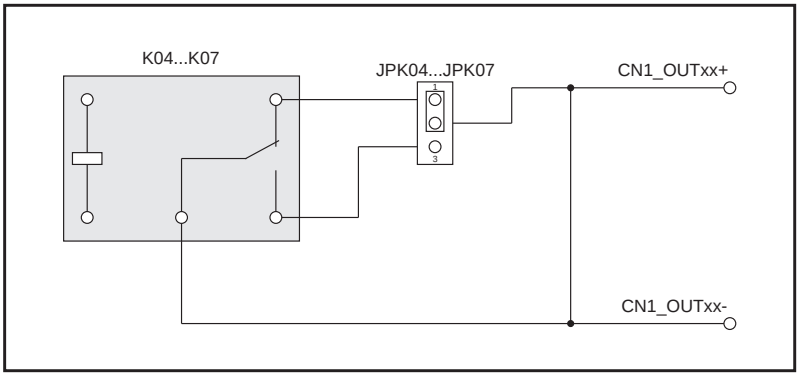
7.1 Pinout of the Relays



7.2 Output Wiring of the Relays K00...K03



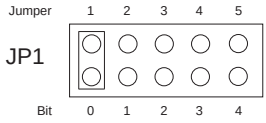
7.3 Output Wiring of the Relays K04...K07



Output	Output Pin CN1		Output	Output Pin CN1	Jumper
Output 00 (NO contact)	NO_OUT00 + (1)		Output 04 (NO contact)	OUT04 + (7)	JP04/ 2-3
	OUT00 - (2)			OUT04 - (26)	
Output 00 (NC contact)	NC_OUT00 + (20)		Output 04 (NC contact)	OUT04 + (7)	JP04/ 1-2
	OUT00 - (2)			OUT04 - (26)	
Output 01 (NO contact)	NO_OUT01 + (21)		Output 05 (NO contact)	OUT05 + (8)	JP05/ -2-3
	OUT01 - (22)			OUT05 - (27)	
Output 01 (NC contact)	NC_OUT01 + (3)		Output 05 (NC contact)	OUT05 - (8)	JP05/ 1-2
	OUT01 - (22)			OUT05 - (27)	
Output 02 (NO contact)	NO_OUT02 + (4)		Output 06 (NO contact)	OUT06 + (9)	JP06/ 2-3
	OUT02 - (5)			OUT06 - (28)	
Output 02 (NC contact)	NC_OUT02 + (23)		Output 06 (NC contact)	OUT06 + (9)	JP06/ 1-2
	OUT02 - (5)			OUT06 - (28)	
Output 03 (NO contact)	NO_OUT03 + (24)		Output 07 (NO contact)	OUT07 + (10)	JP07/ 2-3
	OUT03 - (25)			OUT07 - (29)	
Output 03 (NC contact)	NC_OUT03 + (6)		Output 07 (NC contact)	OUT07 + (10)	JP07/ 1-2
	OUT03 - (25)			OUT07 - (29)	

8. Hardware Configuration

8.1 Board Identification



The board identification is used to distinguish between several PC cards of the same type on the computer. This is done by a jumper block, which can be read by software.

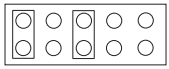
The board identification to be read consists of one Byte (8 Bit) and is structured as follows:

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“ is „1“, if the jumper is set, otherwise „0“

The jumper setting of the jumper block JP1 can be read out by means of the read command. The unused bits are basically „0“, a set jumper is read as „1“.

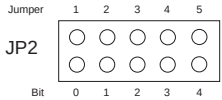
e.g.

JP1  (Jumper 1 and 3 set)

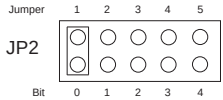
Result of the read command: $05

8.2 Access with 8 or 32 Bit

The jumper blocks JP2/1-2 are used to adjust the access data width.
If the jumper block JP2/1-2 is not set (Default), the board is working in compatibility mode. In this mode, the board is applying an 8 bit access. Additionally, the offset addresses of the PCI board OPTOPRE-PCI8STANDARD are valid with a factor of 4.
If the jumper is set, the card is working in 32-bit mode, and the offset addressing is compatible with other PCIe boards as well as with the PCIe8ULTRA. The offset addresses of both of the modes are discussed in chapter 9.4 „Assignment of the Memory Mapped I/O Addresses“ .



8-Bit mode



32-Bit mode

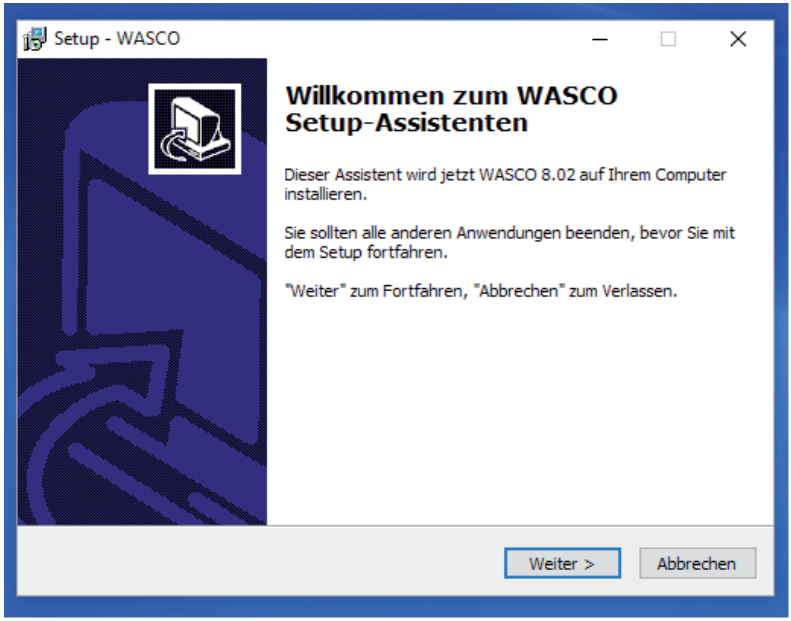
9. Programming under Windows®

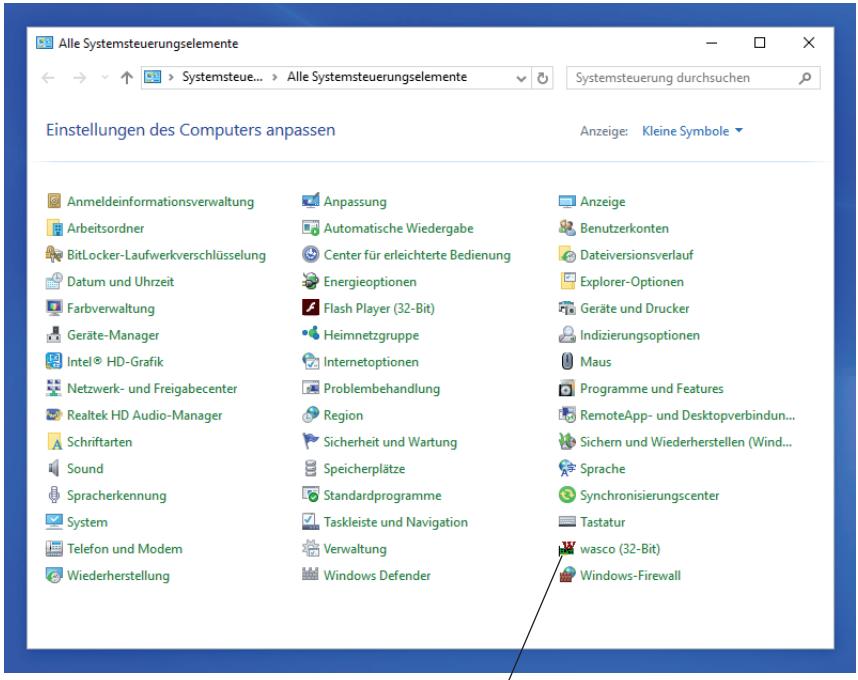
9.1 Installation of the Windows® driver

In order to implement the card under Windows®, it is necessary to install a special driver, which allows access to the card. The operating system under Windows® 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 to 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.

9.2 Installation of the Windows® development files

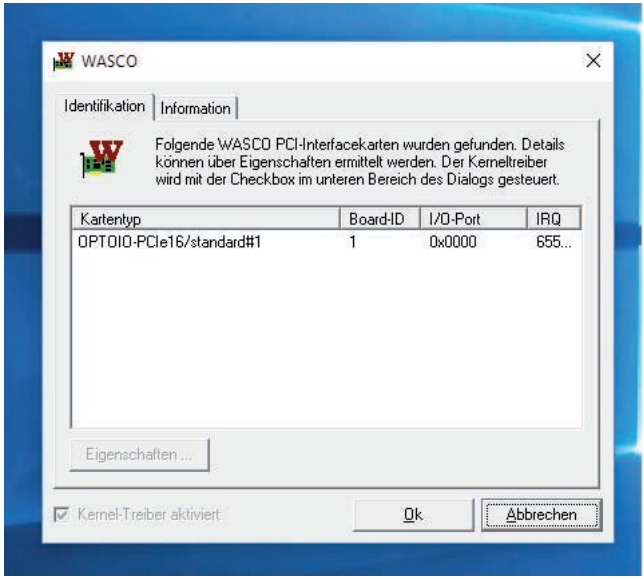
For installation of the development files, please run the file „Setup.exe“ in the folder driver on the accompanying CD and follow the installation instructions.





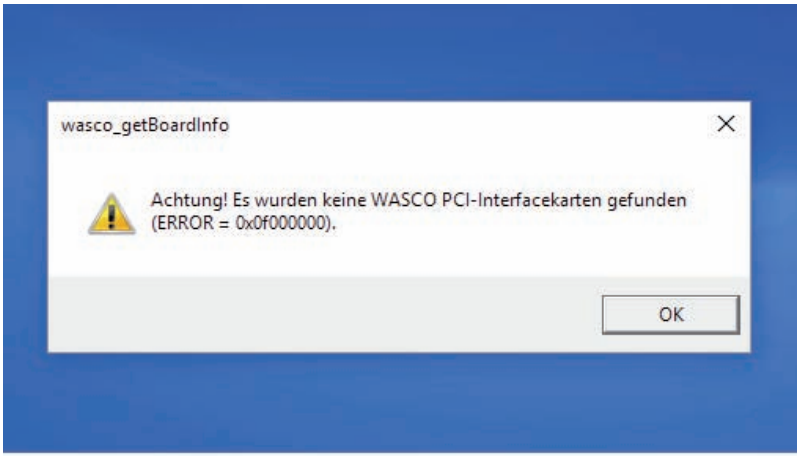
Once the driver and development files have been installed completely, you will find an icon in the control panel of your computer to localize all **wasco**® PCI and PCIe cards available in the system.

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, Board-ID, 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 ascertained via the „Information“ tab.

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



Possible causes are covered in the chapter Troubleshooting.

9.3 Programming the OPTOPRE-PCIe8 with wasco® driver

After installing 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 OPTOPRE-PCIe8 you can find on the enclosed CD or please visit our homepage.

Programming the hardware components of the OPTOPRE-PCIe8 is realized by access to Memory Mapped I/O addresses which depend on the base address assigned by the system‘s BIOS for the OPTOPRE-PCIe8. Find a more detailed description for programming in the driver documentation.

9.4 Assignment of the Memory Mapped I/O Addresses

The Memory Mapped I/O addresses of the single hardware components depend on the base address, as shown in following table:

8-bit mode

Port/Register	BA + Offset	RD/WR
Optocoupler Input Port A (IN00...IN07)	BA + $0	RD
Relay Output Port A (OUT00...OUT07)	BA + $80	RD/WR
Board Identification	BA+ $3E0	RD

32-bit mode

Port/Register	BA + Offset	RD/WR
Optocoupler Input Port A (IN00...IN07)	BA + $0	RD
Relay Output Port A (OUT00...OUT07)	BA + $8	RD/WR
Board Identification	BA+ $FF8	RD

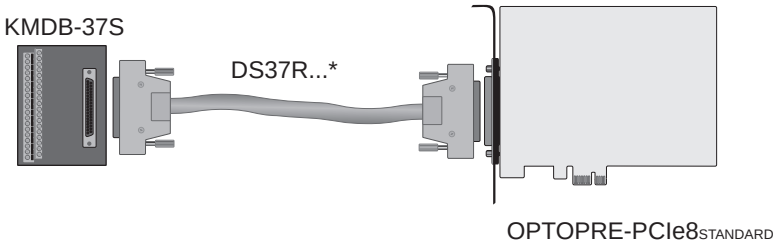
Attention! The offset constants of the driver work directly only with PCI boards. For the programming we recommend to use offsets instead of the constants.

10. Accessories

10.1 Fitting wasco® accessories

Connecting parts	EDP-No.
DS37R500DS37 Connecting cable (5 meters)	A-202800
DS37R200DS37 Connecting cable (2 meters)	A-202400
DS37R100DS37 Connecting cable (1 meter)	A-202200
KMDB-37S Terminal Module	A-204910

10.2 Connection Technique (application examples)



* DS37R100DS37 or DS37R200DS37
or DS37R500DS37

11. Troubleshooting

Following you can find a brief compilation of the most common known causes of errors that may occur during starting-up or during running the OPTOPRE-PCIe8.
Please check these points before you contact your dealer or distributor to solve your problem:

1st Is OPTOPRE-PCIe8 properly inserted into the connector ?

2nd Are all cable connections all right?

3rd Did your system detect the card correctly?
Please check all settings of your computer or contact your system administrator.
(Since these are BIOS settings of the computer we can not go into detail with this topic. We refer to your system manual.)

4th Did you install the latest driver version for the wasco® drivers?
Updates you can find here: http://www.messcomp.com

12. Specifications

Optocoupler Inputs

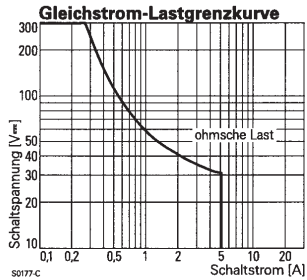
Optocoupler: LTV-244 or compatible
8 channels, optically isolated
Galvanic isolation also between each single channel with each two separate connections
Overvoltage protection by protection diodes
Two different input voltage ranges selectable by jumpers:

Range 1	high = 14..30 Volt
	low = 0..2 Volt
Range 2:	high = 5..15 Volt
	low = 0..1 Volt

Input frequency: max. 10 kHz

Relay Outputs

Channels:	8 channels, galvanically isolated
Relay type:	Tyco PE014012 or compatible
Contact:	1 changeover contact
Switching current:	2 A max.
Switching voltage:	AC 50V max./DC 30V max.
Switching capacity:	100 VA max.
Isolation:	Coil/Contact 500 V eff
Mech. lifetime:	15 * 10^6 switching cycles max. without load
Contact lifetime:	2A, 50V AC, at changeover, 10^5 switching cycles max.
Operation cycles under load:	6/min max.
Operation cycles without load:	1200/min max.
Circuit time:	typ. 5 ms
Fall time:	typ. 2 ms
Bounce time NO contact:	typ. 1 ms
Bounce time NC contact:	typ. 5 ms



DC Load Capacity Graph

Connectors
1 * 37 pin Sub-D female connector

Bus system
32-bit PCI-Bus
(8 or 32 bit data access)

Dimensions of the Board
135 mm x 111 mm (l x b)
standard hight, half length card
Multi layer PCB

Others
Control LEDs for power supply

13. Product Liability Act

Information on Product Liability

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

The obligation to pay compensation may already exist, 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 when handling this product.

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

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

Safety Instructions

The valid VDE regulations must be observed, when handling products that come into contact with electrical voltage.

Particular attention must be paid to the regulations:
VDE100; VDE0550/0551; VDE0700; VDE0711; VDE0860.

You recieve the regulations at the publisher company:
Vde-Verlag GmbH
Bismarckstr. 33
10625 Berlin
Germany

* unplug the power plug before you open the unit or make sure, there is no current to/in the unit.

* You only may start up any components, boards or equipment, if they have been installed in a touch-proof casing before. During installation, the the equipment must be de-energized.

* 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 examined for insulation faults or breaks. In case of any defect the device must be taken out of service immediately, until the defective lines have been replaced.

* When using components or circuit boards you must strictly comply with the characteristic specifications for electrical parameters stated in the relevant description.

* As a non-commercial end-user, if it is not clear whether or not the electrical characteristic specifications given in the provided description apply to a component, you must consult a specialist.

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

14. Declaration of Conformity

This is to certify, that the CE marked product

OPTOPRE-PCIe8STANDARD
EDP Number A-823600

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.

The following standards were considered:

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

submitted by

Dipl.Ing.(FH) Hans Schnellhammer

Wasserburg, 30.01.2018

Reference system for intended use

This PC expansion card is not a stand-alone device. The CE-conformity only can be assessed when using additional computer components simultaneously. Thus the information on the CE conformity exclusively refers to 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 Electronics	519-112111C
Motherboard:	ASUS P5G41-M LE	
Interface:	OPTOPRE-PCIe8$_{STANDARD}$	A-823600

wasco®

Contact Protection Circuit

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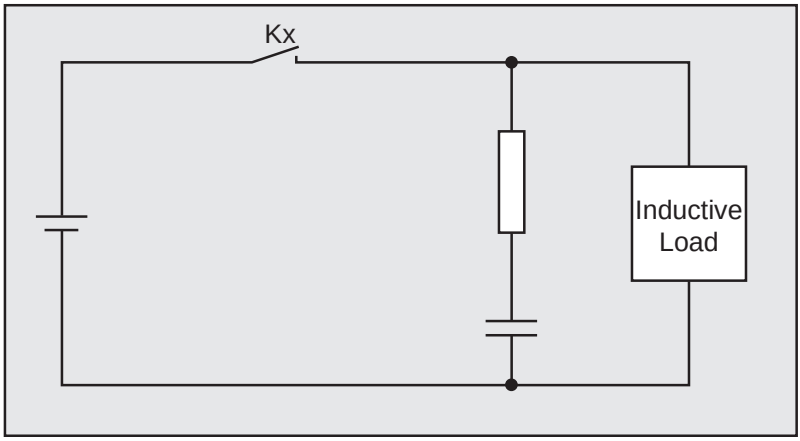
1. Overview

It is always recommended using a protective contact circuit, because this will extend the electrical lifetime of the relays. However, incorrect application of a protective contact could cause reverse effects, such as extension of the relay fall time.
Following you can find some general circuit examples, which you can apply according to the use cases.

Note:
The circuit examples compiled in the following serve as a source of information of a general scope. That means, they are not specially developed for **wasco**® products, but they are also applicable for all to **wasco**® cards connected peripherals. Please note, that not all protective circuit contacts are suitable for **wasco**® cards and **wasco**® modules, because the suitability depends on each use case and the connected peripheral.

Please pay attention to the relevant VDE Instructions!

2. Circuit Example RC Element

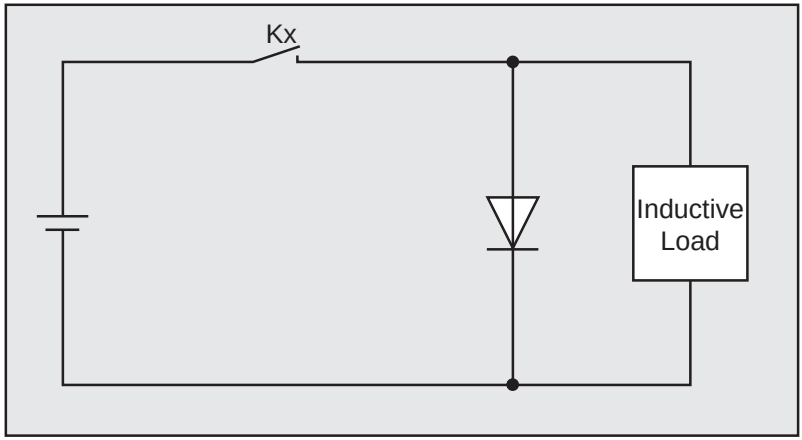


Suitability

A/C voltage:	good
D/C voltage:	good

Applying a load, for example in form of a relay, the fall time of the contacts will delay. This circuit is effective when you connect the load and when mains voltage is between 24 and 48 Volt. A mains voltage between 100 and 240 Volt requires a connection parallel to the contacts.

3. Circuit Example Diode



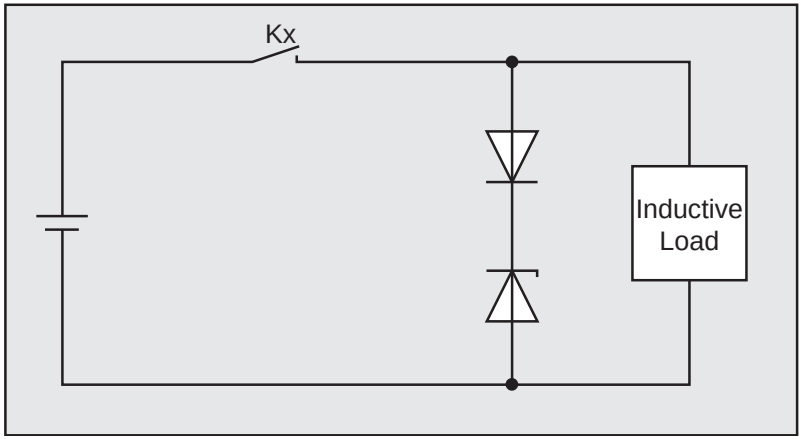
Suitability

A/C voltage:	poor
D/C voltage:	good

At a switch-off of the load the energy (inductive load) stored in a coil generates a current flow via the diode connected parallel to the coil. The current will discharge by the resistance of the inductive load. This connection will delay the fall time more than an RC connection will do.

The used diode has to provide a peak voltage more than10x the switching voltage, and a conducting state current exceeding the load current.

4. Circuit Example Diode and Zener Diode



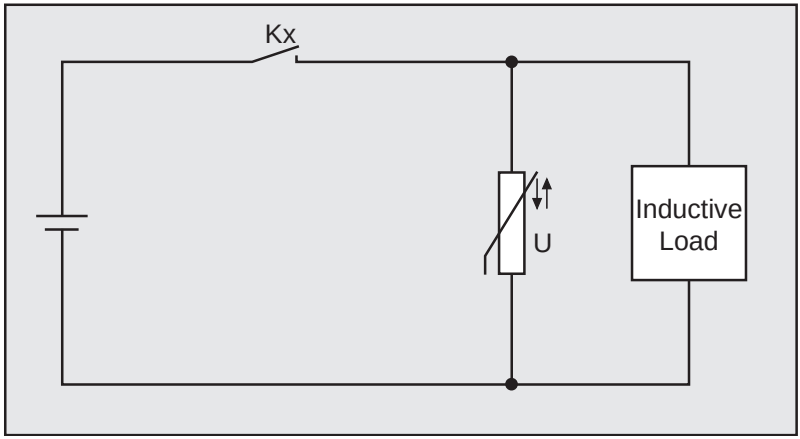
Suitability

A/C voltage:	poor
D/C voltage:	good

If in special applications the fall time achieved by a diode protective circuit is too long, this connection effectively will reduce the fall time.

The cut-off voltage of a Zener diode approximately should correspond to the mains voltage.

5. Circuit Example Varistor



Suitability:

A/C voltage:	good
D/C voltage:	good

This circuit prevents the generation of a high voltage at the contacts. The fall time of the contacts will be delayed slightly using this connection. A varistor connected parallel to the load will be effective at a mains voltage between 24 and 48 Volt. At a mains voltage between 100 and 240 Volt the connection has to be connected parallel to the contacts.