OPTOPRE-PCI8
STANDARD

EDP No.: A-423600

8 Optocoupler Isolated Digital Inputs
8 Relay Outputs

wasco®

user's guide

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1. Description

The **wasco**® interface board OPTOPRE-PCI8_{STANDARD} provides eight digital input channels and eight digital output channels, each of which are galvanically isolated. Inputs are electrically isolated by eight high power optocouplers with integrated Schmitt Trigger function, outputs by eight relays. Additionally the inputs are provided with protection diodes against harmful voltage peaks.

You can adjust two different input voltage ranges by resistor arrays easily to change and plug in. Output relays can cope with a switching current of max. 2 A.

The connections of the input optocouplers and the relay signals are connected to a 37-pin Sub-D female socket, which is mounted to the slot plate of the board.

2. Installation of the OPTOPRE-PCI8STANDARD

2.1 Installing the Board into your Computer

Attention: unplug the power cord before inserting the OPTOPRE-PCI8 or at least make sure that the unit is currentless. Installing the interface board in an operating system may cause damages or destruction to the OPTOPRE-PCI8 and even to other boards of your computer.

Select an empty PCI slot and insert the board. We recommend to consult the computer's user manual to avoid any mistakes and risks before you follow the installation procedure.

Secure the OPTOPRE-PCI8 by screwing the slot plate to the casing of your computer. Otherwise slight movements of the connection cables may cause loose connections.

3. Connectors

3.1 Position of Connectors on the Board

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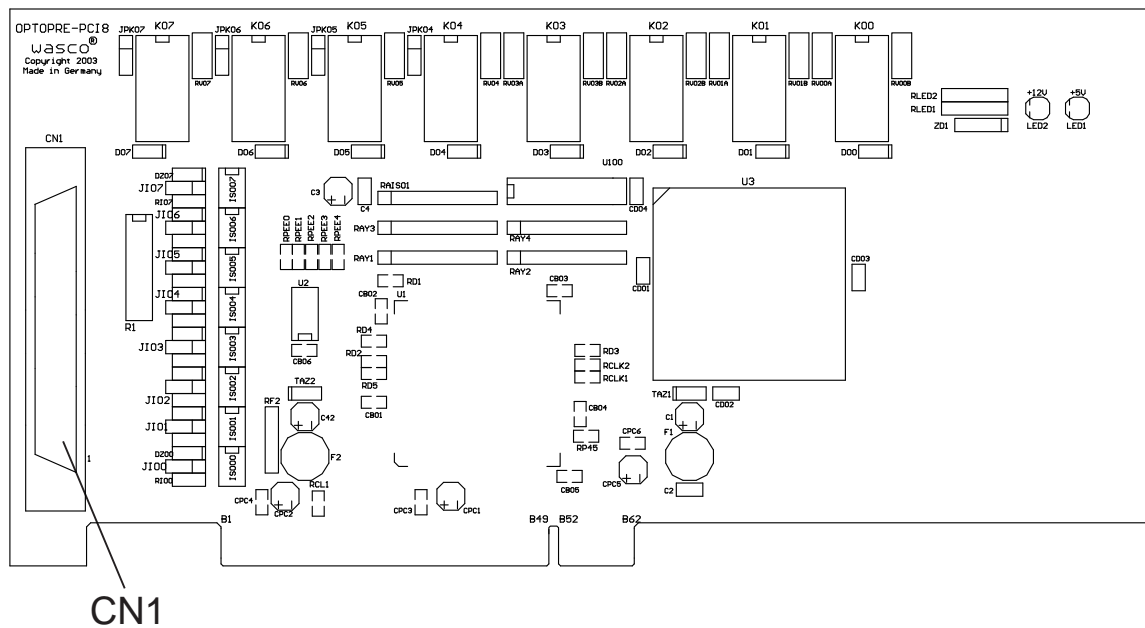
CN1:
Optocoupler input channels IN00...IN07, relay output channels OUT00... OUT07

3.2 Pin Assignment of CN1

```
            IN07-  37○    ○19  GND
            IN06-  36○    ○18  IN07+
            IN05-  35○    ○17  IN06+
            IN04-  34○    ○16  IN05+
            IN03-  33○    ○15  IN04+
            IN02-  32○    ○14  IN03+
            IN01-  31○    ○13  IN02+
            IN00-  30○    ○12  IN01+
          OUT07-   29○    ○11  IN00+
          OUT06-   28○    ○10  OUT07+
          OUT05-   27○    ○9   OUT06+
          OUT04-   26○    ○8   OUT05+
          OUT03-   25○    ○7   OUT04+
       NO_OUT03+   24○    ○6   NC_OUT03+
       NC_OUT02+   23○    ○5   OUT02-
          OUT01-   22○    ○4   NO_OUT02+
       NO_OUT01+   21○    ○3   NC_OUT01+
       NC_OUT00+   20○    ○2   OUT00-
                          ○1   NO_OUT00+
```
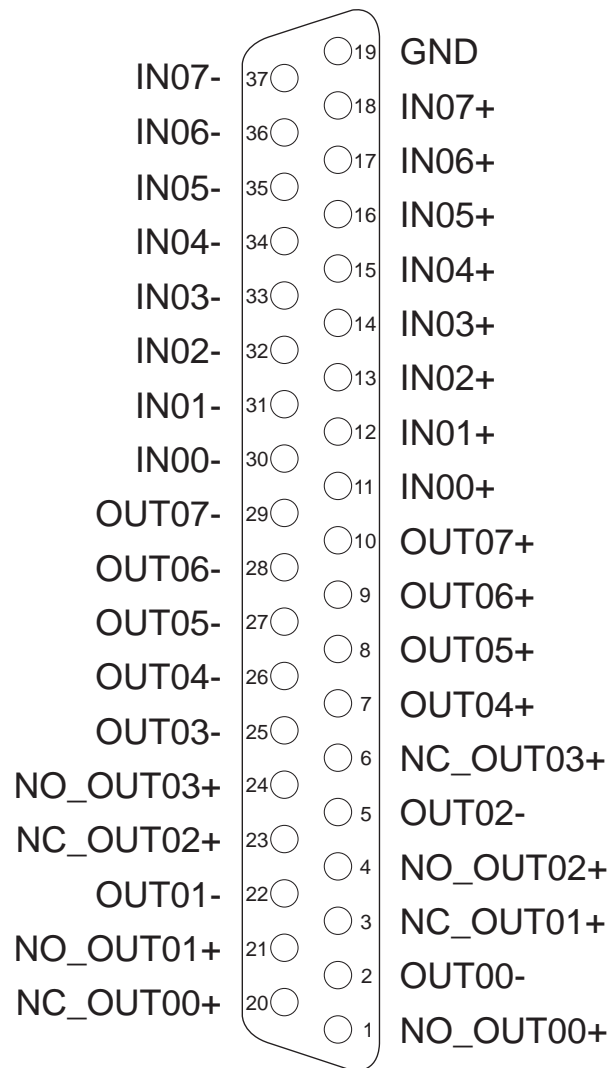
GND:
Ground of the computer

4. Jumper Blocks

4.1 Position of the Jumper Blocks on the Board
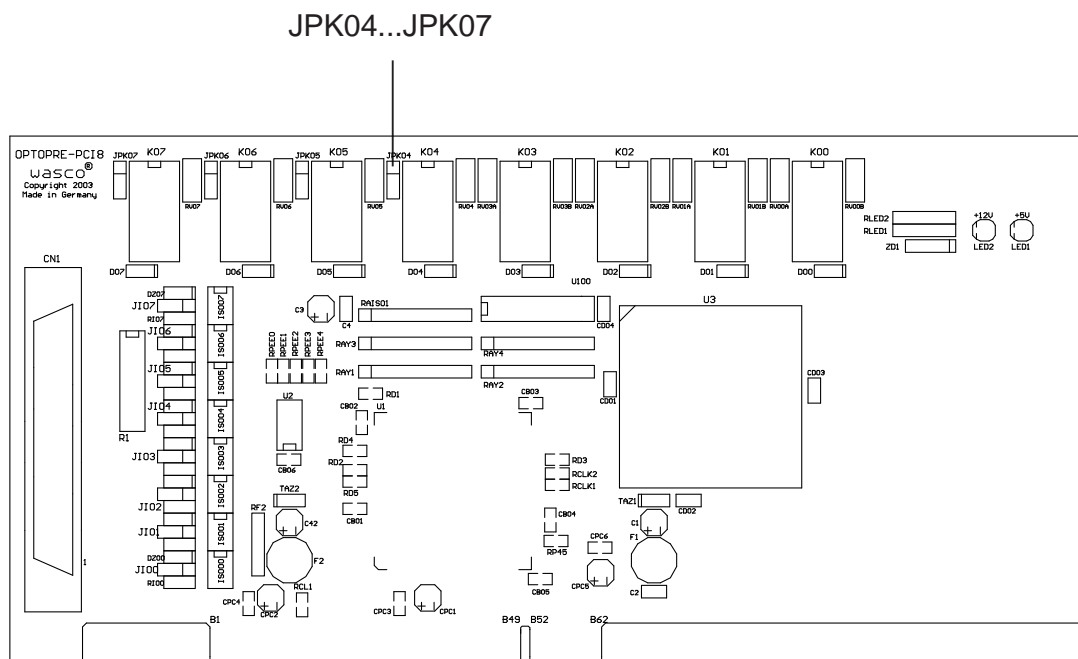
JPK04...JPK07

JPK04...JPK07:
Connection of the print relay outputs OUT04...OUT07 (NO or NC contacts)

4.2 Jumper Block Assignment JPK04...JPK07

JPK04...JPK07

```
    ┌───┐
    │ 1 │
    │┌─┐│
    ││○││
    ││○││
    │└─┘│
    │ ○ │
    │ 3 │
    └───┘
```
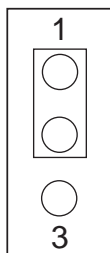
Relay contact as normally closed contact (NCC)

JPK04...JPK07

```
    ┌───┐
    │ 1 │
    │ ○ │
    │┌─┐│
    ││○││
    ││○││
    │└─┘│
    │ 3 │
    └───┘
```
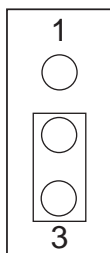
Relay contact as normally open contact (NOC)

5. System Components

5.1 Block Diagram
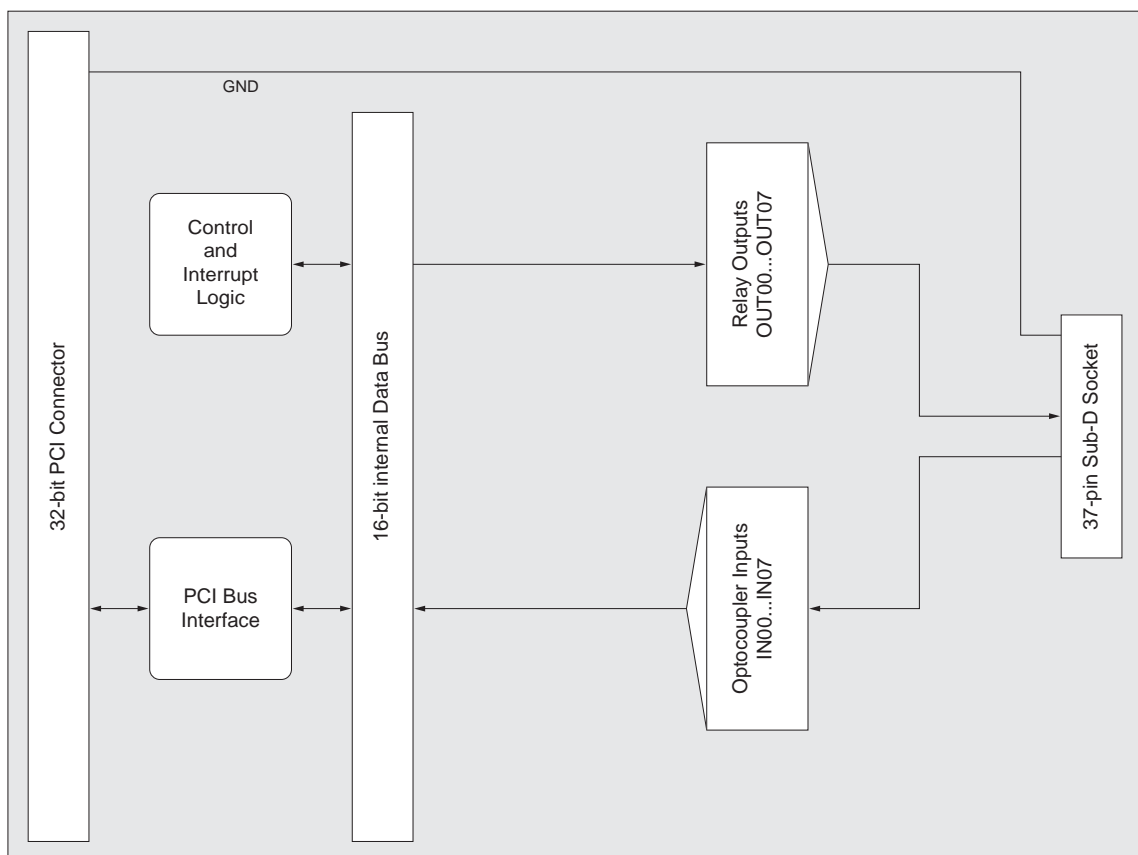
5.2 Access to the System Components

Access to the OPTOPRE-PCI8 hardware components is done by reading or writing in port addresses using library functions. The port addresses relevant to the OPTOPRE-PCI8 result from the base address, which is assigned by the PCI BIOS. The port access to the OPTOPRE-PCI8 is possible exclusively in word access (16 Bit), byte and double word accesses can not be used. (Please refer to chapter „Programming" and to the example programs on the supplied CD).

```
32-bit PCI Connector  <-->  PCI Bus Interface  <-->  Control and Interrupt Logic

16 Bit internal Data bus
```
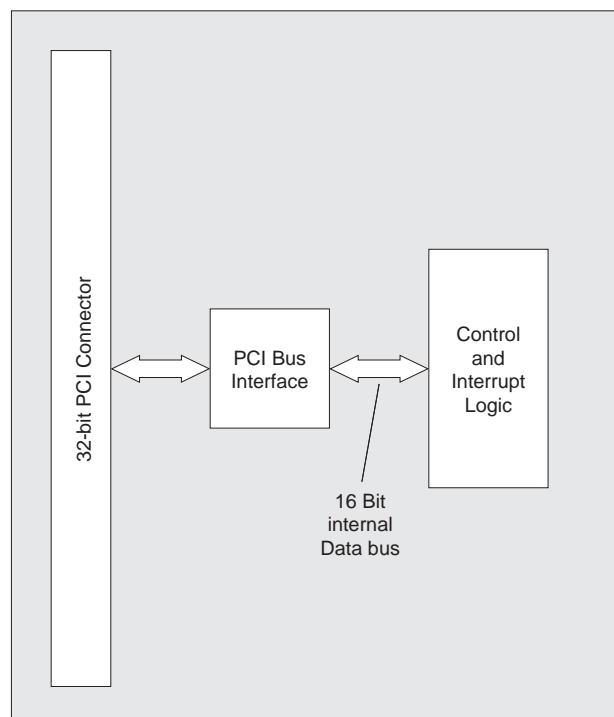
5.3 Miniature Fuses F1, F2

There are two minature fuses (F1, F2) on the board to prevent damages. Two control LED lights indicate the power supply of the I/O components. PCI bus interface and control logic are powered directly by the PCI bus.

6. 8 Optocoupler Inputs

The OPTOPRE-PCI8 provides eight input channels with galvanic isolation by optocouplers. The isolation voltage between GND and the inputs amounts 500 V_{DC}. The isolation voltage between the input lines is limited to 100 V_{DC}. Input optocouplers provide Schmitt Trigger function.

6.1 Pin Assignment of the Input Optocouplers
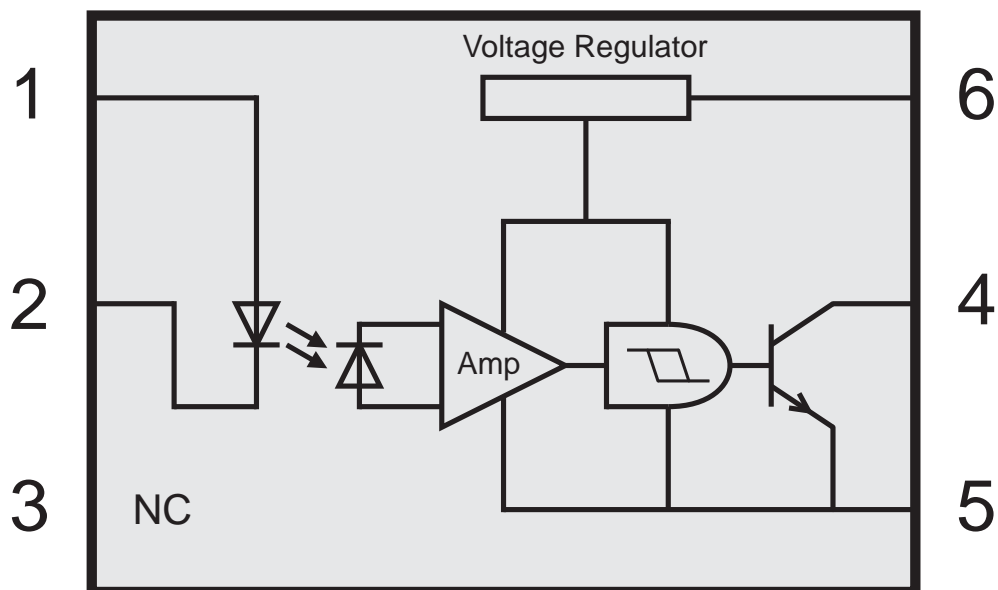
6.2 Input Voltage Ranges

Exchanging the resistor array on R1 allows to select a second input voltage range.
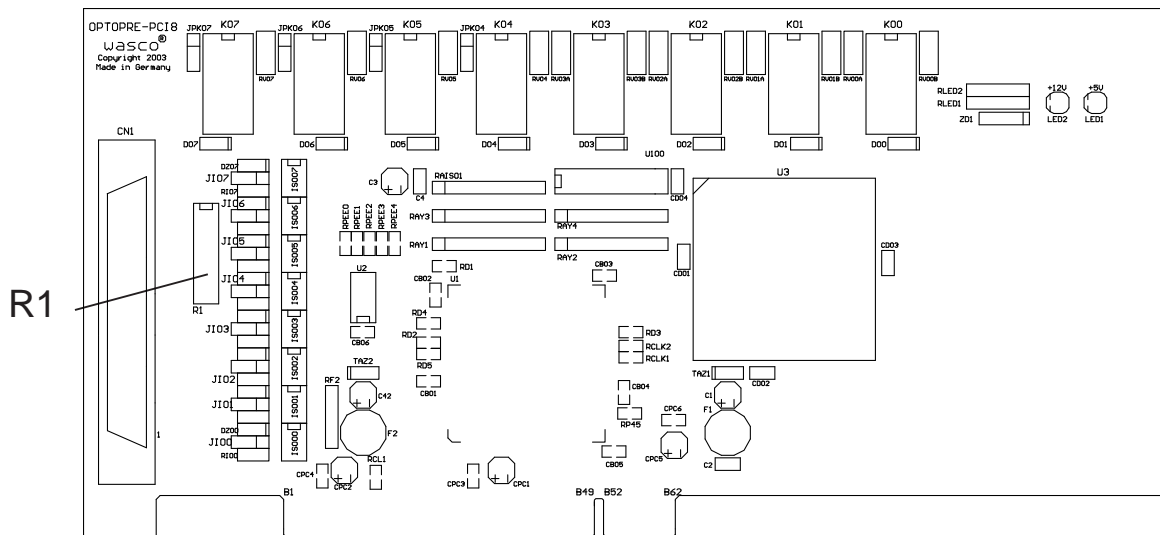
Please see the table below for the data of the two input voltage ranges:

Resistor Array R1	Identifier	Low	High
1,0 KOhm	102	0...1,5 V	2,2...15 V
4,7 KOhm	472	0...4,0 V	7,0...30 V

7. 8 Relay Outputs Channels

The OPTOPRE-PCI8 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
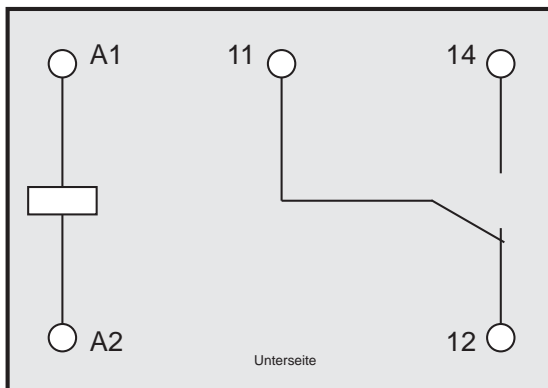
7.2 Output Circuit of the Relays K00...K03
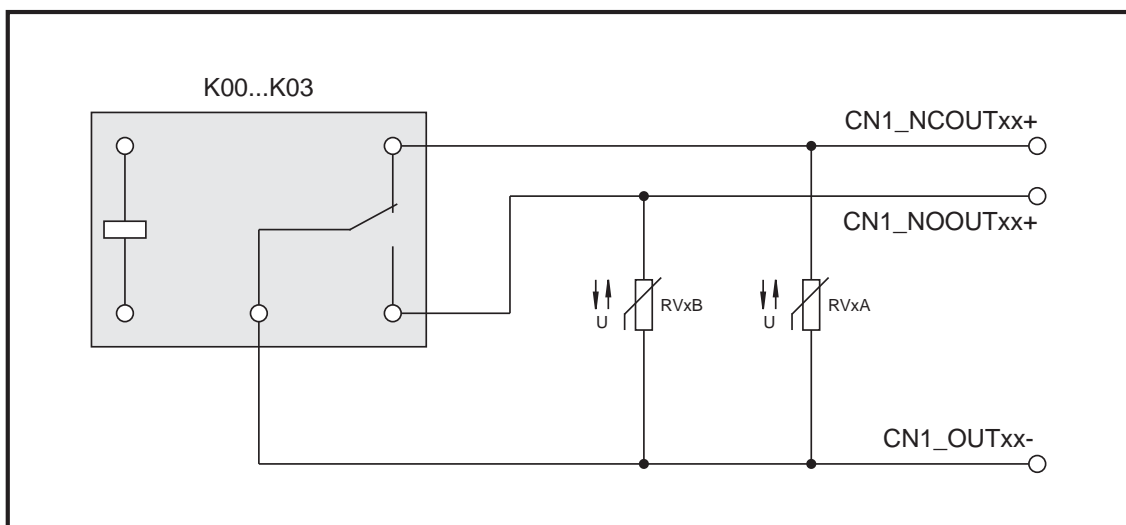
7.3 Output Circuit of the Relays K04...K07
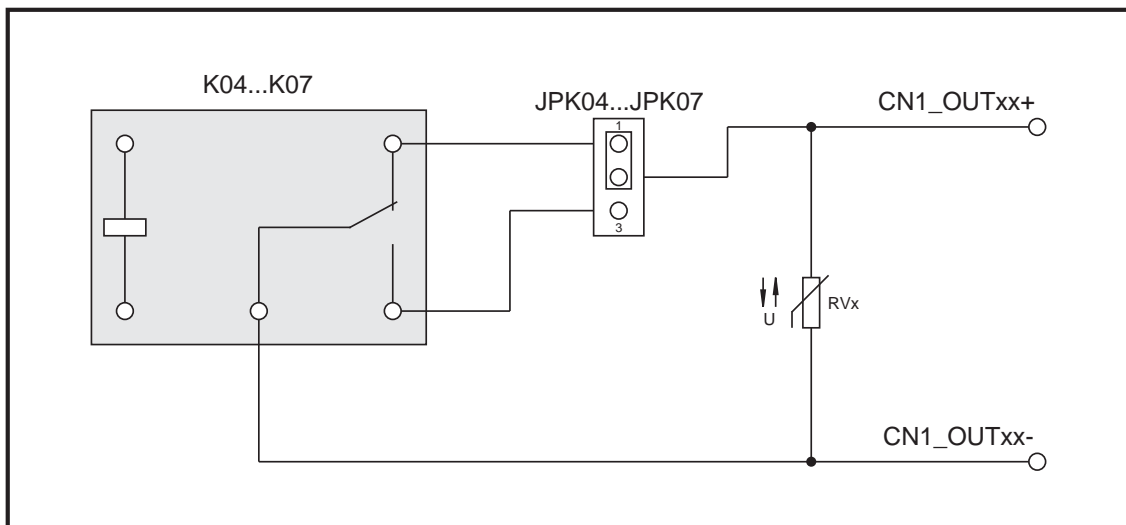
7.4 Contact Protection Circuit

Protection Varistor RV00A/B...RV04A/B, RV04...RV07
To connect an inductive load it may be of benefit to implement a protection varistor parallel to the relay switch contacts.The solder points RV00A/B...RV03A/B and RV00...RV07 are intended to allow customized additional wiring of the OPTOPRE-PCI8STANDARD. Please find more examples for protection circuitry in the appendix „Contact Protection Circuit"

Output	Output Pin CN1
Output 00 (NO contact)	NO_OUT00 + (1) / OUT00 - (2)
Output 00 (NC contact)	NC_OUT00 + (20) / OUT00 - (2)
Output 01 (NO contact)	NO_OUT01 + (21) / OUT01 - (22)
Output 01 (NC contact)	NC_OUT01 + (3) / OUT01 - (22)
Output 02 (NO contact)	NO_OUT02 + (4) / OUT02 - (5)
Output 02 (NC contact)	NC_OUT02 + (23) / OUT02 - (5)
Output 03 (NO contact)	NO_OUT03 + (24) / OUT03 - (25)
Output 03 (NC contact)	NC_OUT03 + (6) / OUT03 - (25)

Output	Output Pin CN1	Jumper
Output 04 (NO contact)	OUT04 + (7) / OUT04 - (26)	JPK04/ 2-3
Output 04 (NC contact)	OUT04 + (7) / OUT04 - (26)	JPK04/ 1-2
Output 05 (NO contact)	OUT05 + (8) / OUT05 - (27)	JPK05/ -2-3
Output 05 (NC contact)	OUT05 - (8) / OUT05 - (27)	JPK05/ 1-2
Output 06 (NO contact)	OUT06 + (9) / OUT06 - (28)	JPK06/ 2-3
Output 06 (NC contact)	OUT06 + (9) / OUT06 - (28)	JPK06/ 1-2
Output 07 (NO contact)	OUT07 + (10) / OUT07 - (29)	JPK07/ 2-3
Output 07 (NC contact)	OUT07 + (10) / OUT07 - (29)	JPK07/ 1-2

8. Programming under DOS®

8.1 Programming

On the included software CD you can find the library functions and example programs to access to the OPTOPRE-PCI8 under DOS®. The programming of the hardware components of the OPTOPRE-PCI8 is controlled by the access to the port addresses.These port addresses result from the I/O base address (and the LC base address), which is issued by the PCI-BIOS for the OPTOPRE-PCI8. By means of the initialization routines you can determine the I/O base address, the LC base address and the actual port addresses of each single hardware component. Additionally further information is available, such as IRQ number, localisation in the bus system or the version of the card.

If you are working with a programming language not (yet) providing library functions, you can determine the PCI parameter of the OPTOPRE-PCI8 running the program „OPPRE8SC" (-> in directory UTIL).

PCI parameters:
- I/O base address
- IRQ number
- LC base address
- Bus number
- Device number
- Function number
- OPTOPRE version

PCI identification:
Device ID	=	$9050
Vendor ID	=	$10B5
Subsystem-Vendor-ID	=	$10B5
Subsystem ID	=	$116B

8.2 Allocation of the Port Addresses

The port addresses of each single hardware component result from the I/O Base address (BA) and the LC Base address (LC) as follows:

Port/Register	BA + Offset	RD/WR
Optocoupler Input Port A (IN00...IN07)	BA + $00	RD
Relay Output Port A (OUT00...OUT07)	BA + $20	WR

9. Programming under Windows®

9.1 Programming of the OPTOPRE-PCI8
For the card's application under Windows® it is necessary to install a special driver, which enables a port access to the card.

9.2 Installing the Windows® driver
To install the Windows® driver please run the file „Setup.Exe" in the folder driver on the included CD and follow the installation procedure instructions.
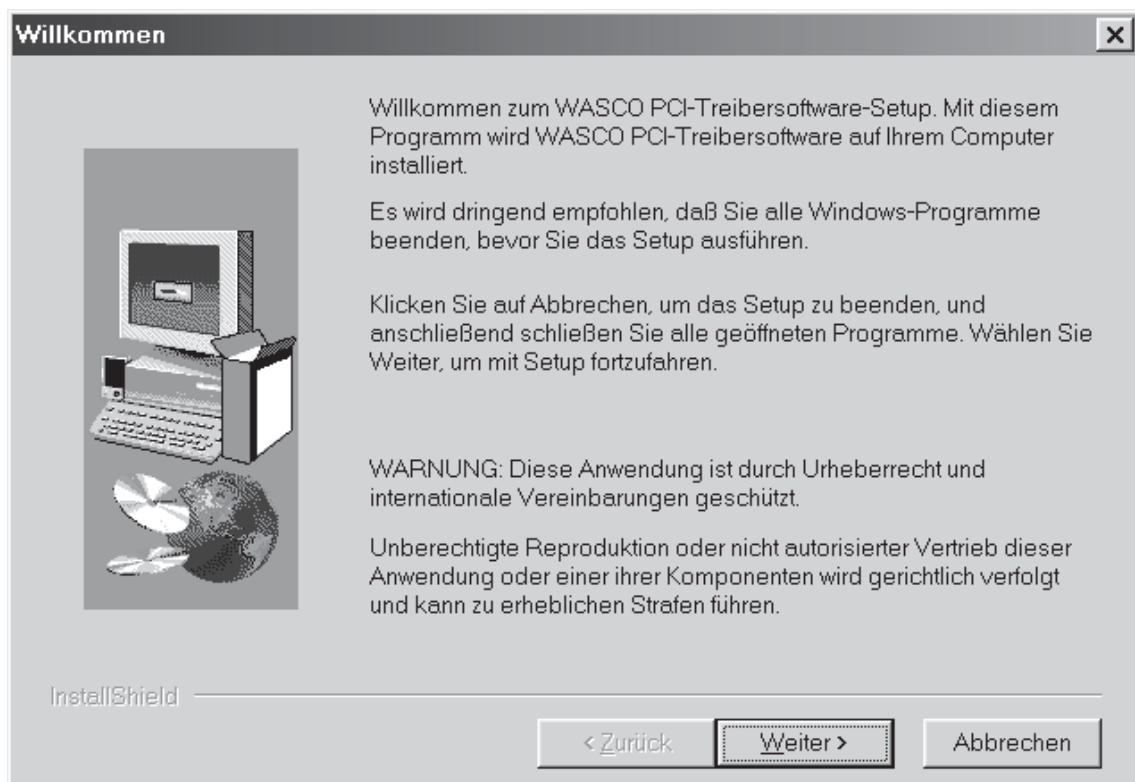
Once the installation of the driver is completed you can find all the necessary development files and instructions for programming the card in the directory c:\programme\wasco\dev. Additionally on the included CD you can find program examples in Visual C++, Delphi, Visual Basic and support for LabView.
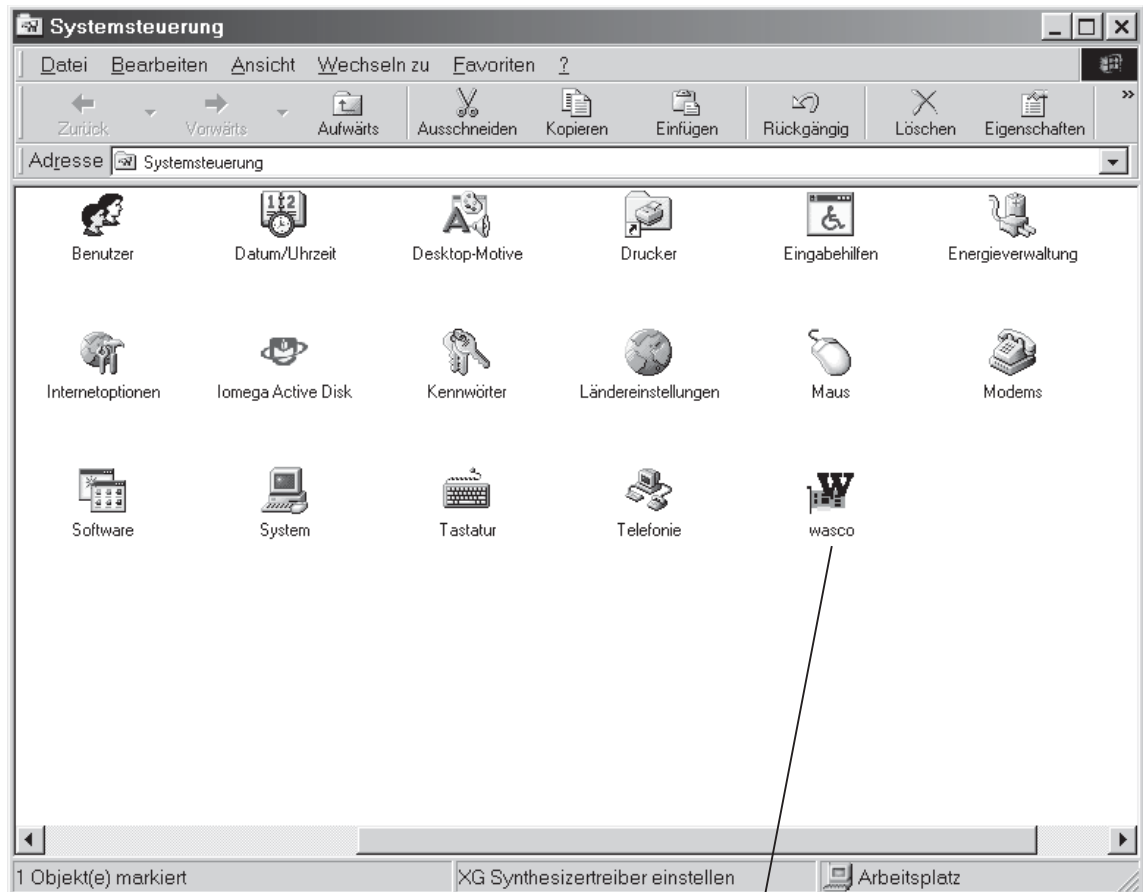
If the driver software has been installed completely, you will find an icon in the system control panel for localisation of all **wasco**® PCI cards existing in your system.

Start the board's monitoring by double-clicking the „**wasco**®" icon.
The following window appears (OPTORE-PCI16 and ADIODA-PCI12 may be used as an example):
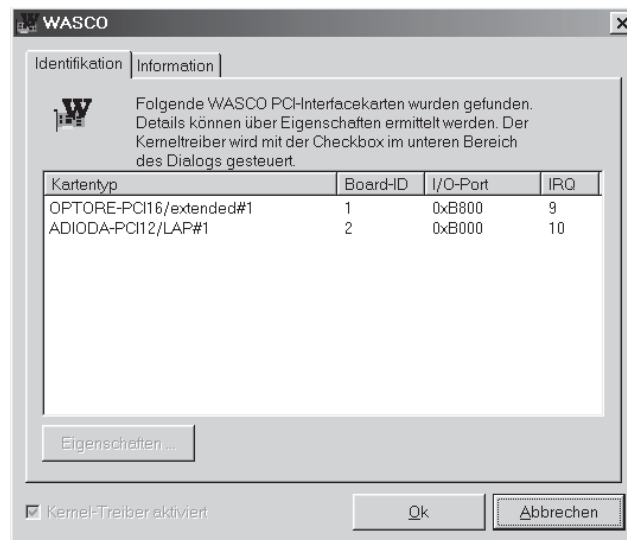
This window presents the card's name, Board ID, I/O address and possible interrupt number, if the card was detected correctly. Furthermore you can find information of the driver version or localisation of the driver file clicking the tab „Information".

If the card has not been detected in your system, the following error messages are displayed:

```
wasco_getBoardInfo                                                    [×]
  ⚠   Achtung! Es wurden keine WASCO PCI-Interfacekarten gefunden (ERROR = 0x0f000000).

                              [    OK    ]
```

```
 WASCO                                                                [×]
┌─────────────┬──────────────┐
│ Identifikation │ Information │
└─────────────┴──────────────┘
  W    Folgende WASCO PCI-Interfacekarten wurden gefunden.
       Details können über Eigenschaften ermittelt werden. Der
       Kerneltreiber wird mit der Checkbox im unteren Bereich
       des Dialogs gesteuert.

  ┌──────────────────────────────┬──────────┬──────────┬───────┐
  │ Kartentyp                     │ Board-ID │ I/O-Port │ IRQ   │
  ├──────────────────────────────┴──────────┴──────────┴───────┤
  │ Keine PCI-Interfacekarten gefunden!                        │
  │                                                            │
  │                                                            │
  │                                                            │
  │                                                            │
  │                                                            │
  │                                                            │
  │                                                            │
  └────────────────────────────────────────────────────────────┘

    [ Eigenschaften ... ]

  ☑ Kernel-Treiber aktiviert        [    Ok    ]   [ Abbrechen ]
```

Please refer to the chapter Troubleshooting for possible causes!

10. Accessories

10.1 Suitable wasco® Accessories

Connecting Parts	EDP No.
DS37R500DS37 Connection cable	A-202800
DS37R200DS37 Connection cable	A-202400
DS37R100DS37 Connection cable	A-202200
KMDB-37 Terminal module (screw clamp with pro-totype area for solder connections)	A-2046

10.2 Termination Technique (Application Examples)

KMDB-37

DS37R...*

OPTOPRE-PCI8STANDARD
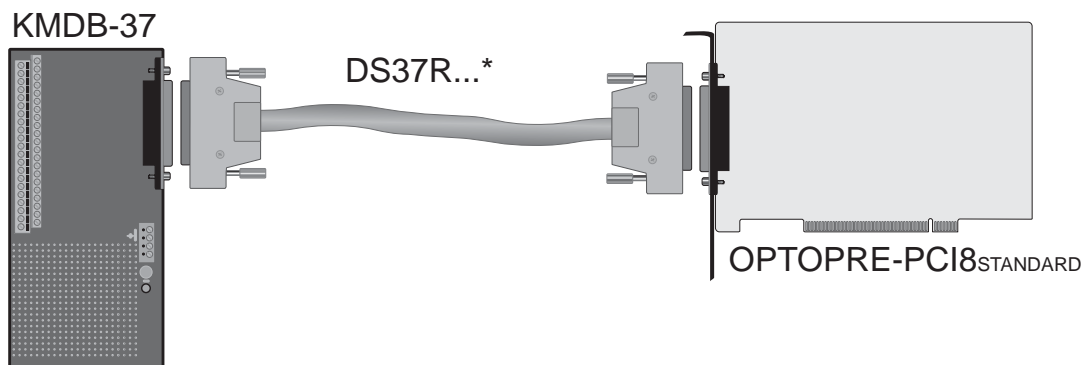
* DS37R100DS37 or DS37R200DS37
or DS37R500DS37

11. Troubleshooting

Following find a short compilation of the most common known causes of errors, that may occur during commissioning or operation with the OP-TOPRE-PCI8.
Please check this list before you contact your dealer or distributor:

1.   Is the OPTOPRE-PCI8 seated to the connector properly?

2.   Are all cable connections OK?

3.   Has one of the fuses (F1, F2) of the OPTOPRE-PCI8 blown?

4.   Did your system detect the card correctly?
      For this please check all configurations of your computer or
      contact your system administrator. (As this configurations are
      part of the BIOS system, we cannot expand on this issue here.
      We refer to your system's user manual)

5.   Did you install the latest driver version of **wasco**® driver?

      Updates you can find here: http://www.messcomp.com
                                        http://www.wasco.de

12. Specifications

Optocoupler Inputs

Optocoupler:	8 * PC900
Channels:	8 channels, galvanically isolated, interrupt capable, Schmitt Trigger function, overvoltage protection by protection diodes
	Two input voltage levels adjustable by the resistor arrays provided:

R = 4,7 kOhm:	high = 8...30 Volt
	low = 0...4 Volt

R = 1,0 kOhm:	high = 2,2...15 Volt
	low = 0...1,5 Volt

Isolation voltage:	500V (between IN and OUT)
Isolation voltage:	100V (between input lines)
Input frequency:	max. 10 KHz

Relay Outputs

Channels:	8 channels, galvanically isolated
Relay type:	Tyco PE014012
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
(internal data bus 16 Bit)

Fuses

+5V   1A Miniature fuse F1
+12V   1A Miniature fuse F2

Power consumption

+5V   typ. 340mA
+12V   typ. 140mA

13. Product Liability Act

Information for 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 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 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 cord 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 has 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 saved in components in the device are to be discharged prior.

* Voltaged 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 are replaced.

* When using components or boards you must strictly comply with the characteristic data for electrical sizes shown in the corresponding description.

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

The compliance with building and safety instructions of all kinds (VDE, TÜV, industrial injuries corporation, etc.) are entirely the responsibility of the user/customer.

14. CE Confirmation

This is to certify, that the product

OPTOPRE-PCI8STANDARD
EDP Number A-423600

comply with the requirements of the relating EC directives. 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.

EN 5502 Class B
IEC 801-2
IEC 801-3
IEC 801-4
EN 50082-1
EN 60555-2
EN 60555-3

The following manufacturer is responsible for this declaration:

Messcomp Datentechnik GmbH
Neudecker Str. 11
83512 Wasserburg

given by

Dipl.Ing.(FH) Hans Schnellhammer
(CEO)

Wasserburg, 29.05.2006

Reference system for intended use

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

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:	GA-586HX	PIV 1.55
Floppy-Controller:	on Motherboard	
Floppy:	TEAC	FD-235HF
Grafic Card:	Advantech	PCA-6443
PC Interface:	OPTOPRE-PCI8STANDARD	A-423600

Contact Protection Circuit

Index

1. Overview

It is allways 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 periphery. Please regard, that not all protective circuit contacts are suitable for **wasco**® cards and **XMOD**® modules, because the suitability depends on each use case and the connected periphery.

Please pay attention to the relevant VDE Instructions!

# 2. Circuit Example RC Element
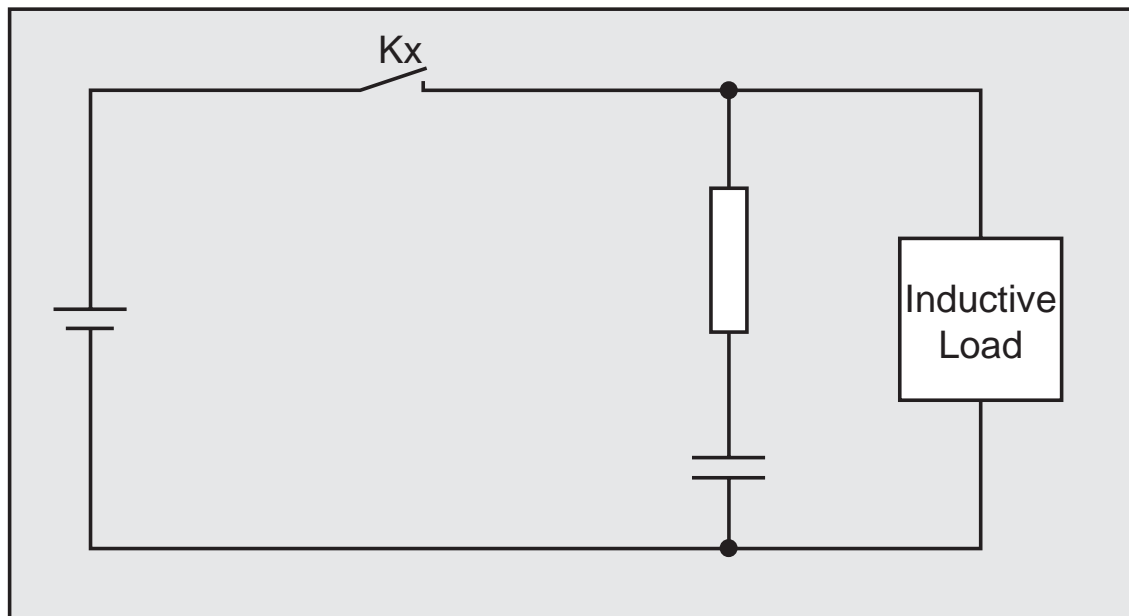
Suitability

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 Diodee
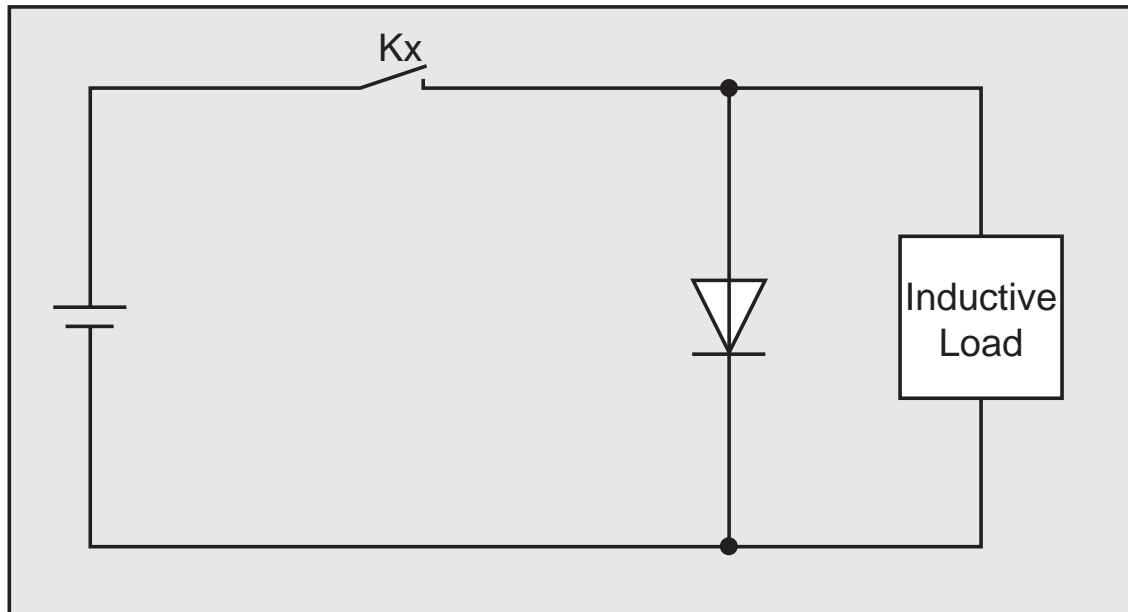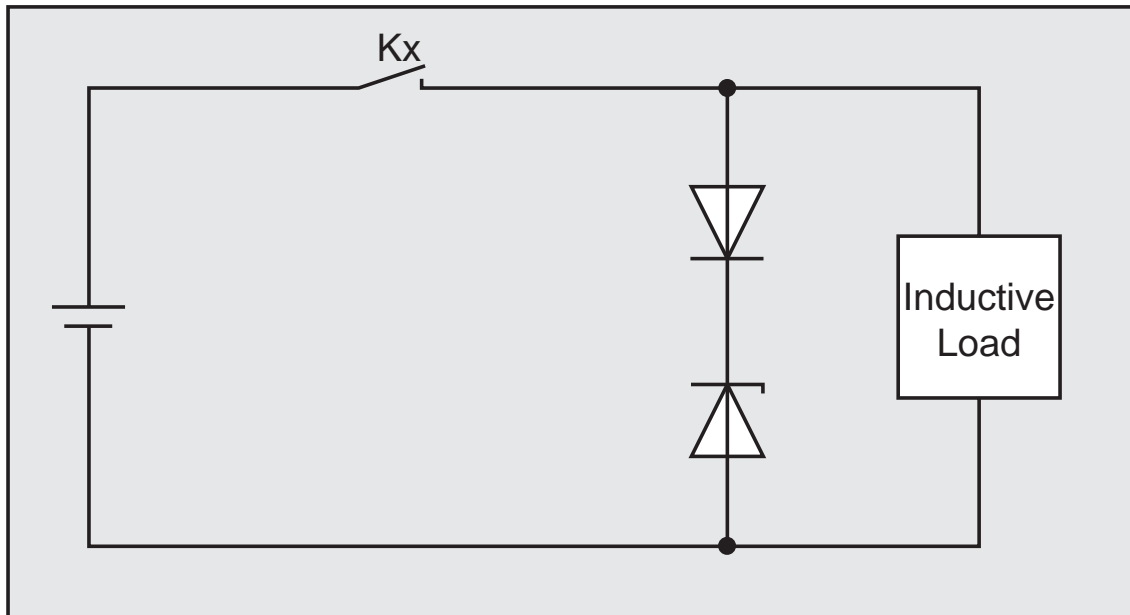

Suitability

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
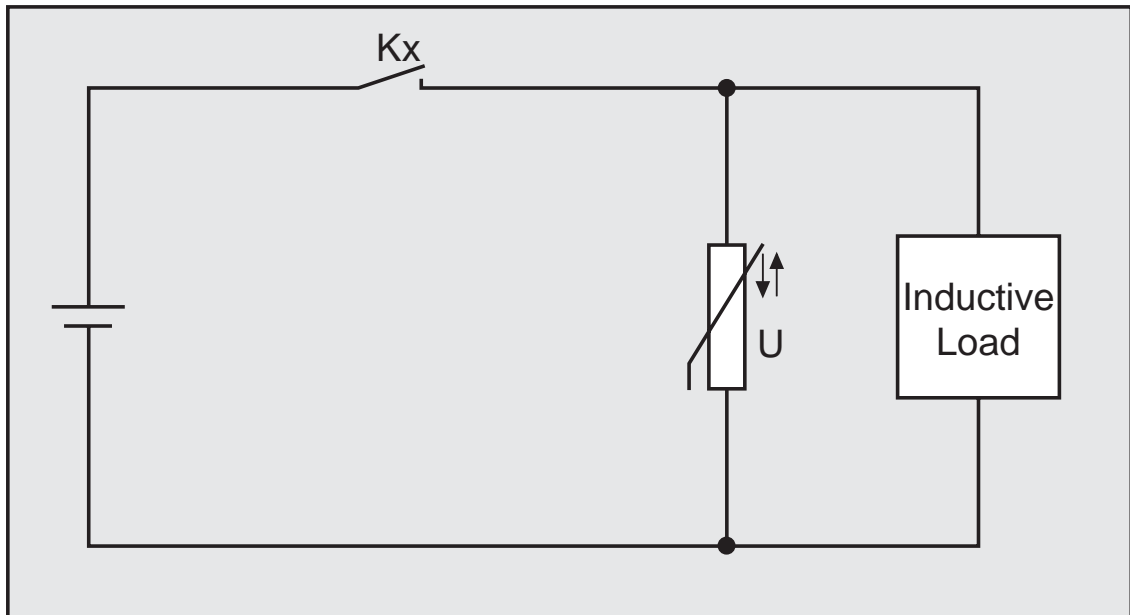

Suitability

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.