![MEILHAUS ELECTRONIC]

Meilhaus Electronic Manual

ME-630

(PCI, PCI-Express, CompactPCI)

8/16 Relays, 16 TTL I/Os, TTL Inputs and/or Opto-Isolated Inputs

Imprint

Manual ME-630

Revision 3.0E

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Content

1   Introduction

Valued customer,

Thank you for purchasing this device from Meilhaus Electronic. You have chosen an innovative high-technology product that left our premises in a fully functional and new condition.

Please take the time to carefully examine the contents of the package for any loss or damage that may have occurred during shipping. If there are any items missing or if an item is damaged, please contact us immediately.

Before installing the board in your computer, we recommend you read this manual carefully, especially the chapter describing board installation.

The descriptions in this manual concern PCI-, PCI-Express- and CompactPCI-versions of the ME-630 series if not otherwise noted.

1.1   Important Notes

1.1.1 Use in Accordance with the Requirements

The PC boards of the ME-series are designed for acquisition and output of analog and digital signals with a PC. Depending on type install the models of the ME-series into:

> a free PCI slot (PCI versions) or

> a free PCI Express slot (PCIe versions) or

> a free CompactPCI-slot (3 HE cPCI versions)

For information on how to install a plug-in board please read the manual of your PC.

Please note the instructions and specifications as presented in this manual (Appendix A, Specifications):

- Please ensure sufficient heat dissipation for the board within the PC housing.
- All unused inputs should be connected to the ground reference of the appropriate functional section. This avoids cross talk between the input lines.

- The opto-isolated inputs and outputs achieve an electrical isolation of the application relative to PC ground.
- Note that the computer must be powered up prior to connecting signals by the external wiring of the board.
- As a basic principle, all connections to the board should only be made or removed in a powered-down state of all components.
- Ensure that no static discharge occurs while handling the board or while connecting/disconnecting the external cable.
- Ensure that the connection cable is properly connected. It must be seated firmly on the D-Sub connector and must be tightened with both screws, otherwise proper operation of the board cannot be guaranteed.

1.1.2 Improper Application

PC plug-in boards for the PCI-, PCI-Express- or CompactPCI-bus may not be taken into operation outside of the PC. Never connect the devices with voltage-carrying parts, especially not with mains voltage.

Make sure that no contact with voltage-carrying parts can happen by the external wiring of the device. As a basic principle, all connections should only be made or removed in a powered-down state.

1.1.3 Unforeseeable Misapplications

The device is not suitable to be used as a children's toy, in the household or under unfavourable environmental conditions (e.g. in the open). Appropriate precautions to avoid any unforeseeable misapplication must be taken by the user.

1.2 Package Contents

We take great care to ensure your delivery is complete.
Nonetheless, please check the list enclosed to verify the contents
of your delivery. You should find included:

- Relay board for PCI, PCI-Express or CompactPCI
- Manual in PDF format on CD/DVD
- Driver software on CD/DV
- 78-pin D-Sub male connector
- Additional mounting bracket (PCI-, PCI-Express- and Compact-PCI-versions)
- 25-pin D-Sub male connector

1.3 Features

Model overview:

Model	Relays	Opto-In	TTL-In	TTL-I/Os*	IRQ
ME-630/16 PCI/PCIe/cPCI	16	8	8	16	2 (TTL)
ME-630/8 PCI/PCIe/cPCI	8	8	8	16	2 (TTL)
ME-630/16-O PCI/PCIe/cPCI	16	16	–	16	2 (isolated)
ME-630/8-O PCI/PCIe/cPCI	8	16	–	16	2 (isolated)

Table 1: Model overview ME-630 family

The ME-630 series are universal relay boards designed for PCI-,
PCI-Express- resp. CompactPCI-bus.

Common features to all models:

- 8 resp. 16 changeover relays (Form C), switching loads up to 30 V/2 A (DC/AC),
- 8 opto-isolated inputs working with 24 V input level.

Additionally, the standard models (without „-O" in the model name)
provide...

8 TTL-inputs and 2 TTL-interrupt-inputs ...

instead of the „O" versions provide:

- 8 opto-isolated inputs and 2 opto-isolated interrupt inputs working with 24 V input level.

PCI-Express models as well as PCI and cPCI with hardware revision 3.0 and higher:

- 16 additional TTL-I/Os. These are organized as 2 bi-directional, 8-bit-wide TTL-ports. Connection is done by the 25-pin D-Sub connector ST2. Therefore an extra mounting bracket is included with the package of PCI-, PCIe- and CompactPCI-versions.

1.4   System Requirements

The ME-series may be installed into any PC (Intel® Pentium® processor) with a free standard PCI-, PCI-Express- resp. CompactPCI-slot (32 bit, 33 MHz, 5 V). The board is supported by the Meilhaus Electronic Intelligent Driver System (ME-iDS).

1.5   Software Support

The ME-series is supported by the Meilhaus Electronic Intelligent Driver System (ME-iDS). The ME-iDS is a unique driver system covering different devices and operating systems. It supports Windows 2000/XP/Vista and Windows 7, 8.1, 10 and contains a universal function library (API) for all common programming languages.

A detailed description of the functions can be found in the ME-iDS manual on the CD/DVD enclosed.

Please also note the corresponding README-files.

2 Starting up

Please read your computer's instruction manual on how to install new hardware components **before installing the board**.

2.1 Software Installation

- Installation under Windows

The following basic procedure should be used:

If you have received the driver software as an archive file please unpack the software **before installing the board**. First choose a directory on your computer (e.g. C:\Temp\Meilhaus\ME-iDS).

Use the Meilhaus Electronic Intelligent Driver System (ME-iDS) for programming your new data acquisition hardware. For installation and operation of the driver system, please follow the documentation in electronic form included with the software package.

2.2 Power Supply for PCI-Express Models

Because of the PCI-Express slot drive's insufficient current for operation of the board, an additional supply is required via the PC power supply. For that purpose connect a free „MOLEX"-connector of the PC (also as used for power supply of drives) with the appropriate terminal of the board (see the following diagram).
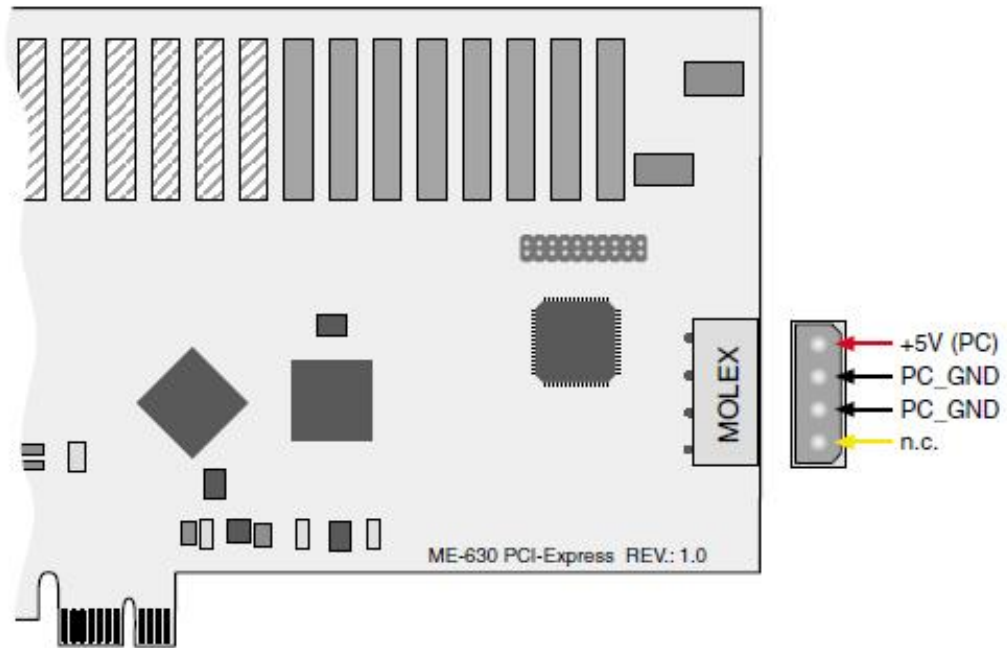
Diagram 1: Additional supply PCI-Express models

2.3 Test Program

For simple testing of the board use the corresponding test program provided with the ME-iDS.
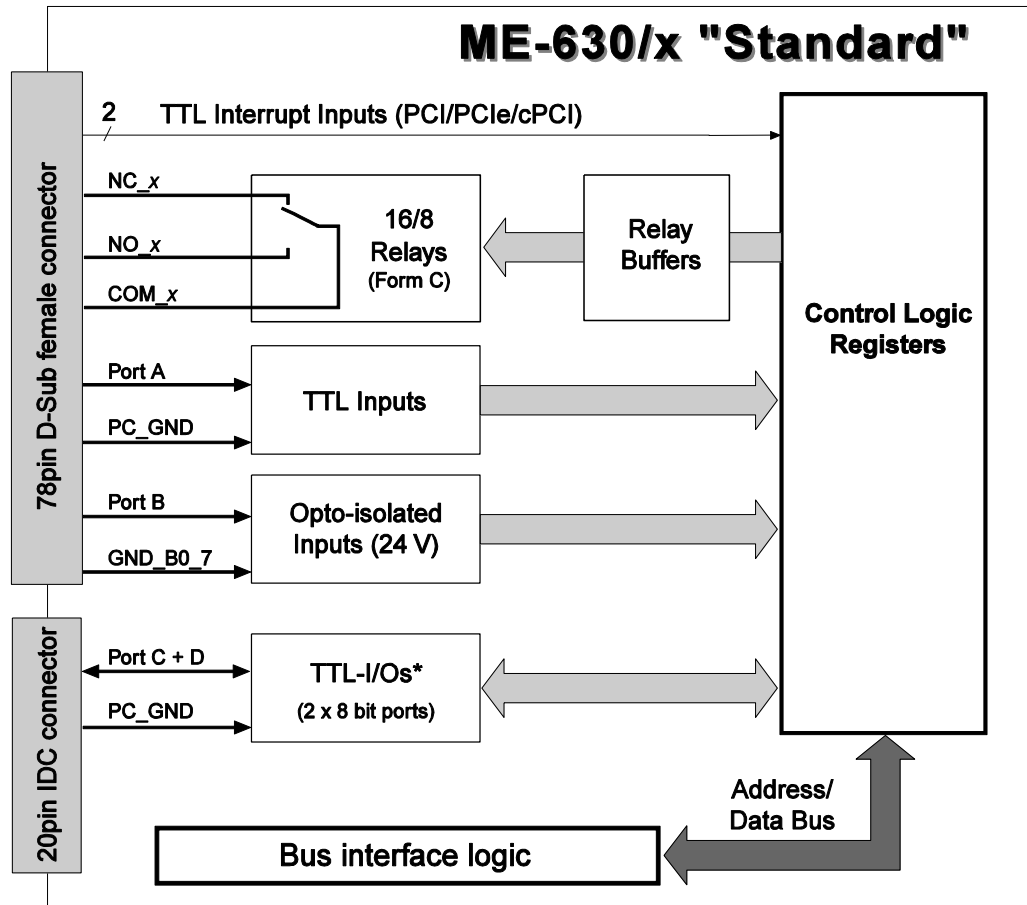
3   Hardware

3.1   Block Diagrams

Diagram 2: Block diagram of ME-630 "Standard"

ME-630/16 PCI/PCIe/cPCI: 16 relays (type C), 2 IRQ-inputs

ME-630/8 PCI/PCIe/cPCI: 8 relays (type C), 2 IRQ-inputs

All boards...   provide 8 TTL-inputs, 8 opto-isolated inputs,
                  16 bidirectional TTL-I/Os*

*TTL-I/OS on all PCI-Express as well as PCI- and cPCI-models with hardware revision 3.0 and higher.
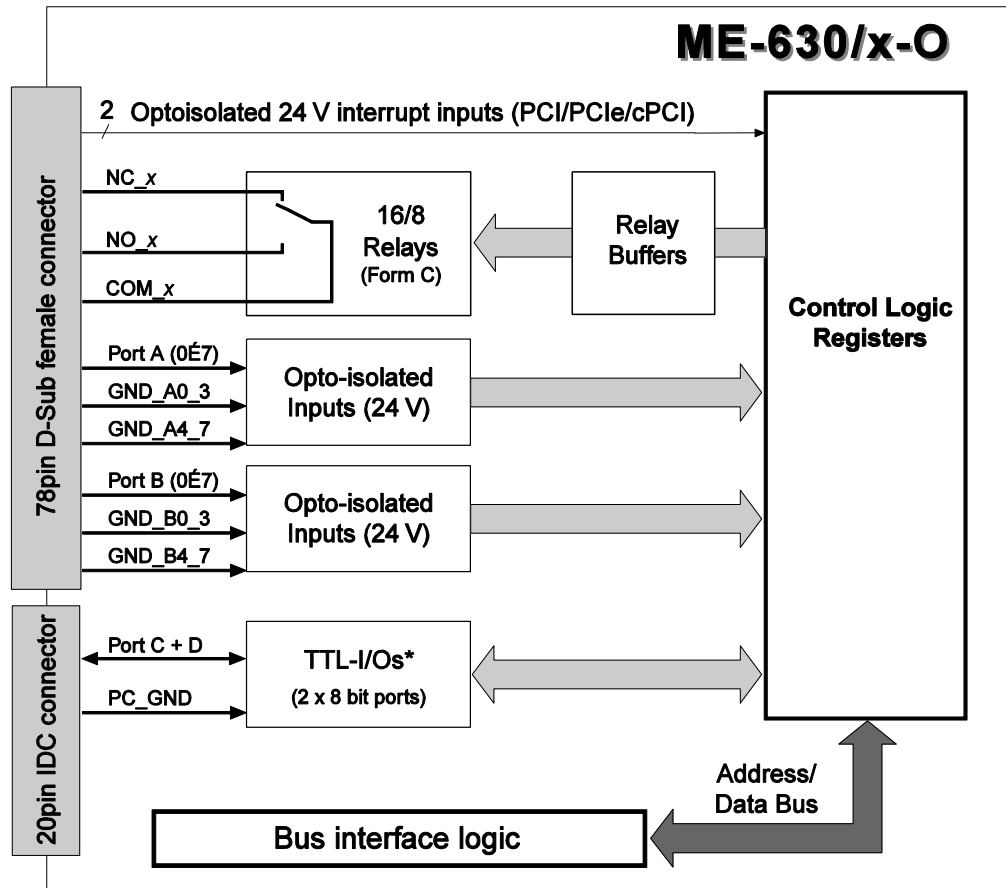
Diagram 3: Block diagram of ME-630/x-O

ME-630/16-O PCI/PCIe/cPCI: 16 relays (type C),

                                   2 opto-isolated IRQ-inputs

ME-630/8-O PCI/PCIe/cPCI: 8 relays (type C),

                                   2 opto-isolatedIRQ inputs

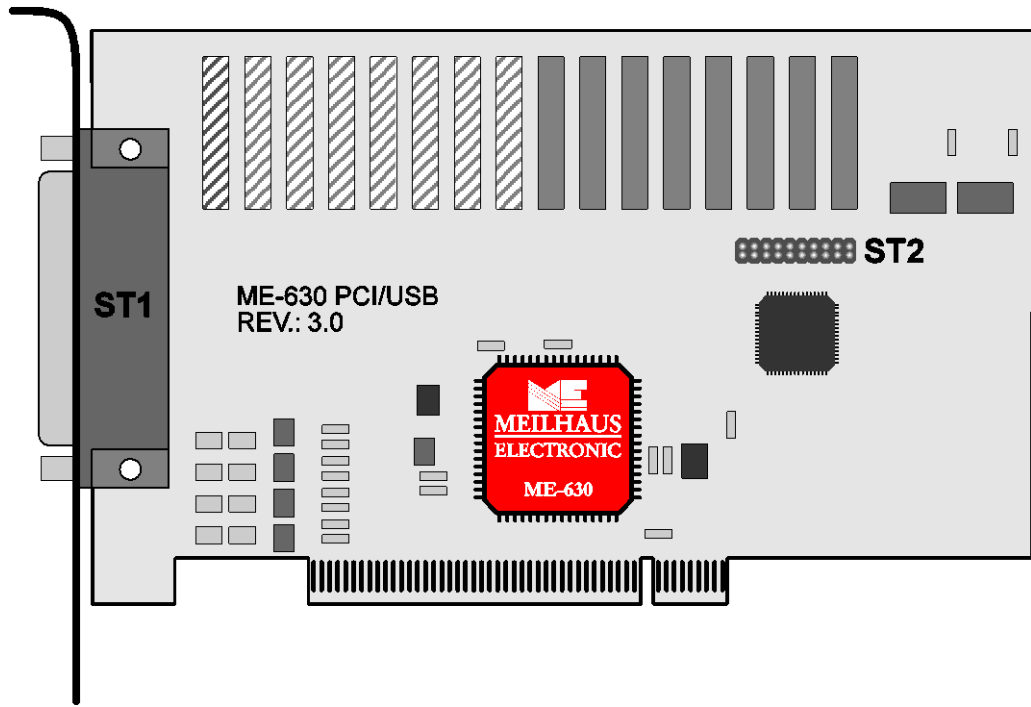**All boards...**   provide 16 opto-isolated inputs and 16 bidirectional TTL-I/Os
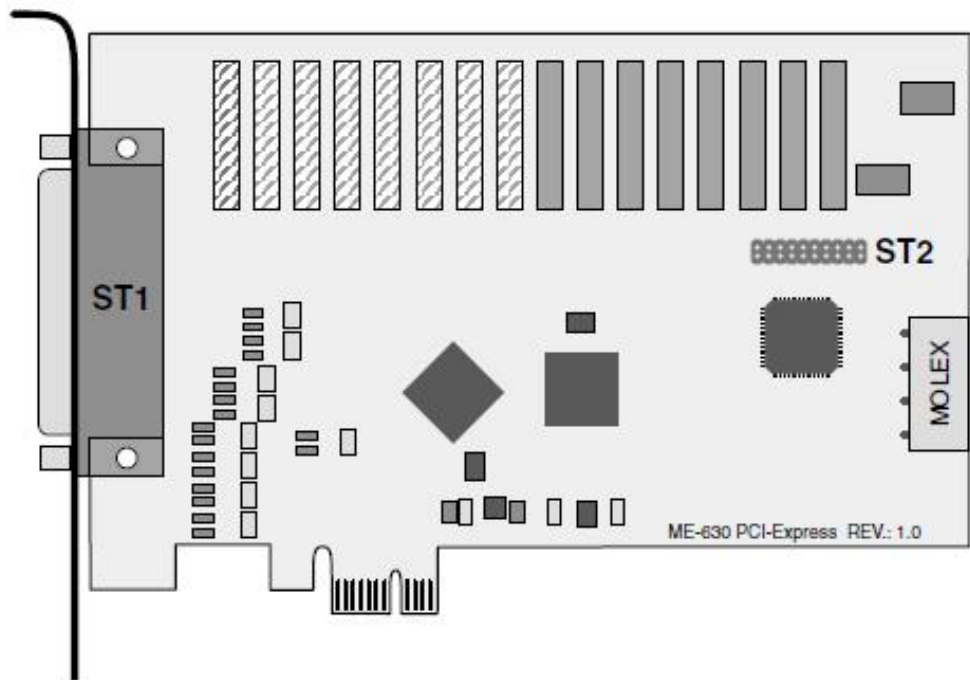
Diagram 4: ME-630 PCI
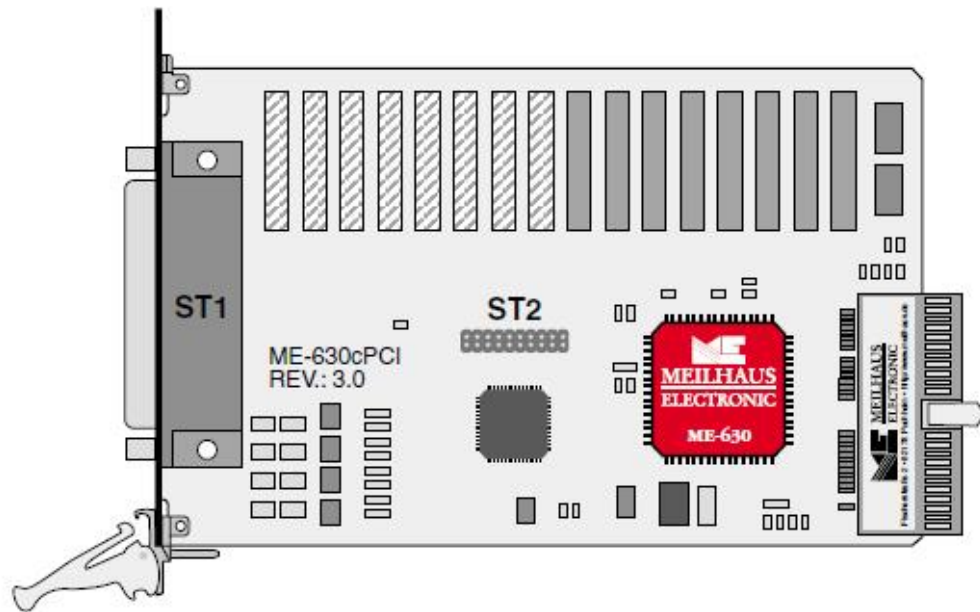

Diagram 5: ME-630 PCI-Express

Diagram 6: ME-630 cPCI

3.2   General Notes

Important Note: The external connections to the board should only be made or removed in a powered-down state.

Before handling and installing the board and cable, make sure that you ground yourself. Electrostatic discharge can damage some of the more sensitive components on the board.

Look for proper connection of the cable. It must join the Sub-D jack completely and must be fixed with both screws. Otherwise a proper operation of the board cannot be guaranteed!

All unused input channels should be grounded to avoid crosstalk between the input lines.

For the pin configuration of the 78-pin female D-Sub see „78-pin D-Sub (ST1) – ME-630 „Standard" on page 29).

In the following chapters you find a description for wiring of each functional group. For details of operation modes and programming, please read chapter 4 on page 22 and following.

3.3   Relays

The real current carrying rating of the ME-630 depends on several conditions, which are described in the following.

Important Notes:

Choose sufficient wire gauges for your external wiring (e.g. 0.5 mm^2 at 2 A). Note the resulting power dissipation and provide a sufficient ventilation of the housing. We strongly advise you to stick to the following maximum values for the carrying rating of the ME-630:

- When using the connector cable ME-AK-D78(/1): max. **0.5 A** per relay
- When using an external wiring with sufficient dimensioning:

  - Permanent load at 25 °C environmental temperature: max. **2 A** per relay
  - Short-term load: max. **3.5 A** of single relays

The total power dissipation P_G of all relay channels of the board must not exceed 12.8 W!

The resistance R_n of the board per channel (connector, track, relay contact) is typ. 200 mΩ (max. 250 mΩ). Use the following formula for the power dissipation per channel P_n at I_n = 2 A (with n = 1…16):

$$P_n = I_n^2 \cdot R_n = 22\ A \cdot 0.2\ \Omega = 0.8\ W$$

i.e. the total power dissipation is:

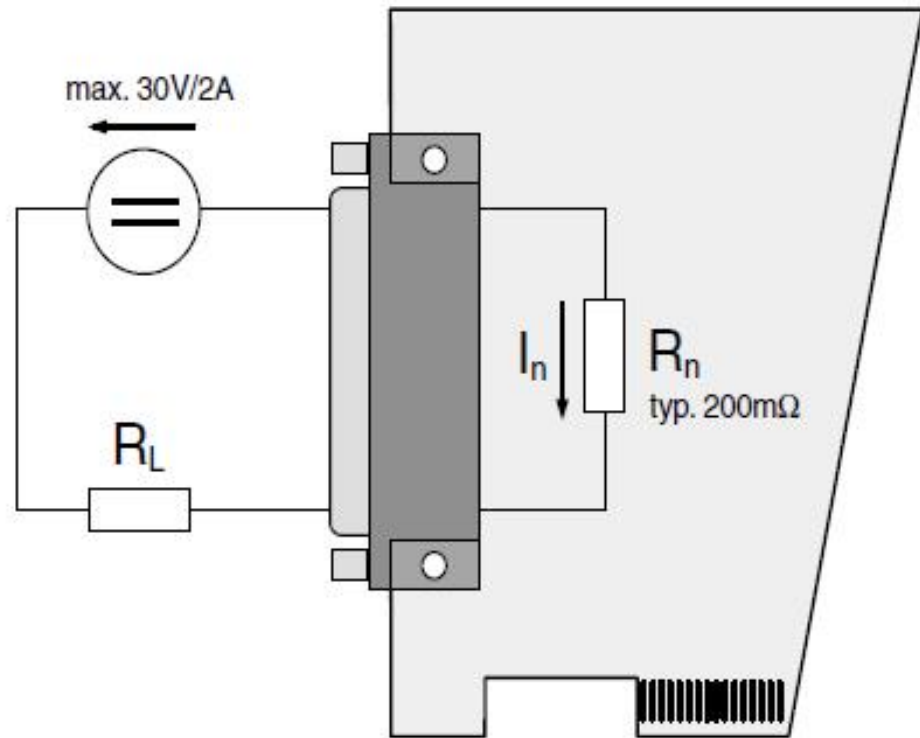$$P_G = P_{n=1} + … + P_{n=16} \leq 12.8\ W$$

Diagram 7: Power dissipation of the ME-630

Apart from the permanent load, induced voltages and high transient currents during switching the relays can occur. Therefore the use of a protection circuit for the contacts is urgently needed. To guarantee the efficiency of the protection circuit the distance should not exceed more than 20 cm from the contact.

The following diagram shows a typical circuitry that could be used. The values of the components used depend on the load and the relay properties. The condensator $C_{NC/NO}$ suppresses the discharge when contact opens and the resistor $R_{NC/NO}$ limits the current when switching the next time. The circuitry can be used for DC and AC operation. The ME-630 offers a normally open contact as well as a normally closed contact. Therefore the protection circuit must be provided for every contact switching a considerable load.

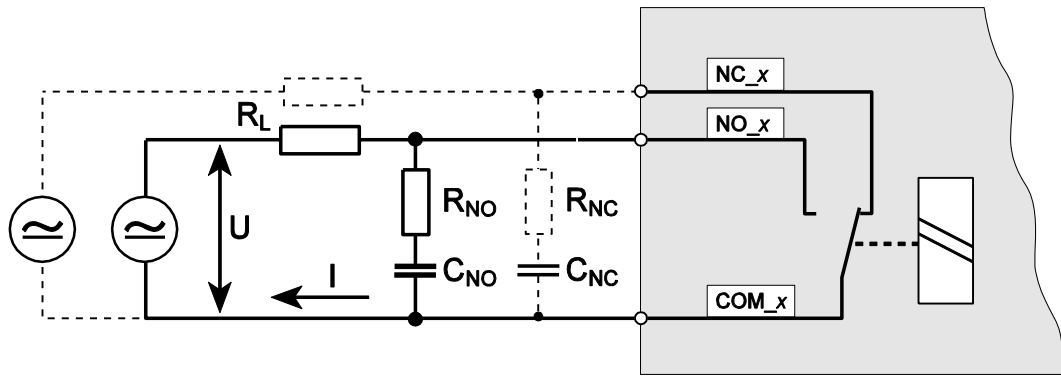*Diagram 8: Wiring of the relays*

As a rule for selection of $R_{NC/NO}$ and $C_{NC/NO}$ use:

$R_{NC/NO}$: 0.5…1 Ω per 1 V of switching voltage U

$C_{NC/NO}$: 0.5…1 μF per 1 A of switching current I

Note: If the computer is powered down and after power-up the common contacts (COM_x) are connected with the normally closed contacts (NC_x).

3.4   Digital-I/O Section

3.4.1 TTL-Inputs

The standard models of the ME-630 series provide 8 TTL-inputs (port A). Make sure that the signals are within the TTL-signal-level-specifications (Low: 0 V...+0,8 V; High: +2,0 V...+5,5 V) and that a connection to PC ground (Pin 1) exists.
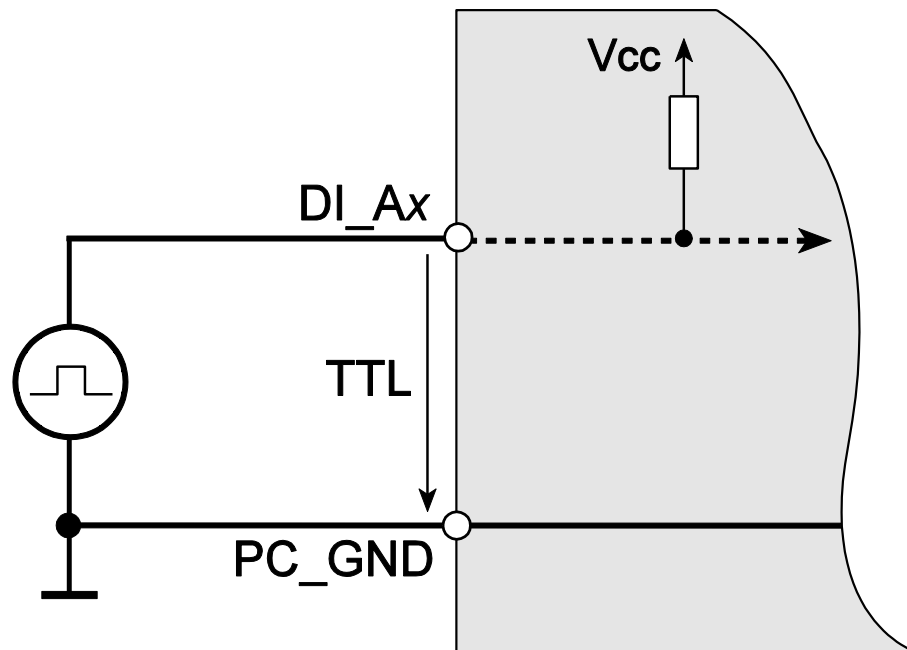

Diagram 9: Wiring the TTL-inputs

3.4.2 Opto-Isolated Inputs

The standard models of the ME-630 series provide 8 opto-isolated inputs (port B) and the models with option „-O" provide 16 opto-isolated inputs (port A and B). The opto-isolated inputs are designed for 24 V level, which

 is common in industrial environment (Low: 0 V...+12 V; High: +13 V...+24 V). Make sure that a ground reference to the external wiring is done by the various GND pins of the D-Sub connector ST1. On the standard models these are the pins 21 and 40. Note on the models with „-O" option, that for the higher and lower significant half-byte separate grounds are used. Depending on the wiring you must connect the pins 1, 6, 21 and 40 separately (see also table 2 and the pinout on page 19). If the inputs are open a logical „0" is returned (see diagram).
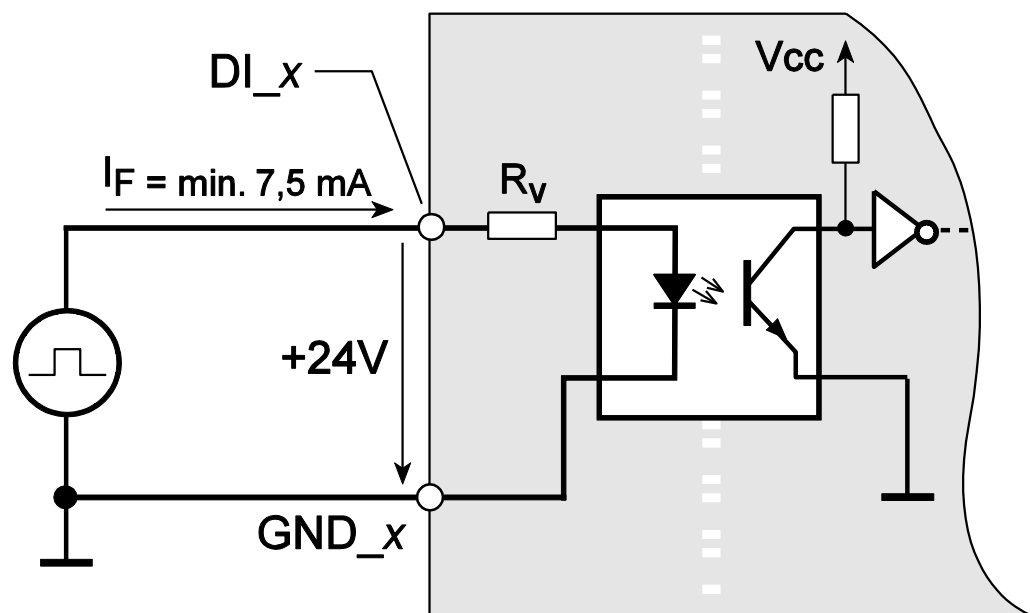
Diagram 10: Wiring of the opto-isolated inputs

Port A	GND-pin	Port B	GND-pin
DI_A0...3	Pin 6 (GND_A0_3)	DI_B0...3	Pin 21 (GND_B0_3)
DI_A4...7	Pin 1 (GND_A4_7)	DI_B4...7	Pin 1 (GND_B4_7)

Table 2: Assignment of GNDs with option "-O"

3.4.3 Bidirectional TTL-Ports

All PCI-Express models as well as PCI and cPCI models with hardware revision 3.0 and higher provide two TTL-ports with 8 bits each. Each port can be configured independently as input or output. After power up, all ports are set to input. For more information about programming refer to chapter 4.2 "Digital-I/O Section" on page 23.

Both ports C and D are available by the 25-pin D-sub female connector ST2. With the PCI-, PCI-Express- and CompactPCI-models the additional mounting bracket ME-AK-D25F/S is required (see pinout on page 28).

It is important that the voltage levels of the digital input/output wiring is within the TTL-level-limits (see specifications on page 25) and that a reference to PC ground (PC_GND) is made.

The maximum output current is $I_{Out} = I_{OL} = I_{OH} = 10$ mA.
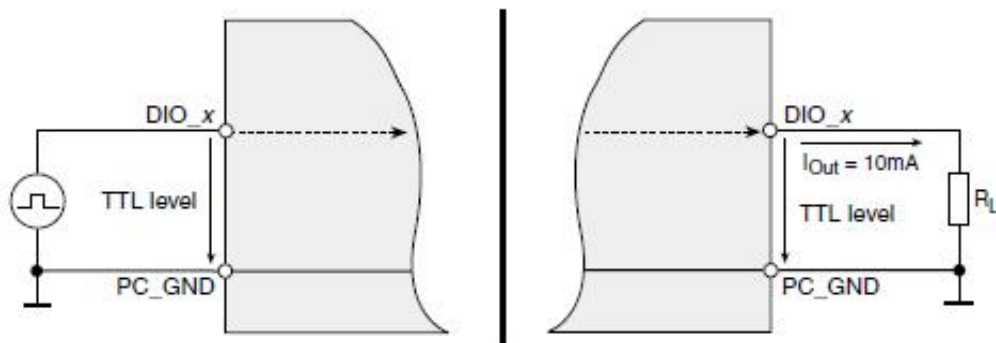

Diagram 11: Wiring of the digital inputs

3.5   Interrupt Inputs

The PCI-, PCI-Express- and CompactPCI-models of the ME-630 series offer 2 independent external interrupt inputs.

On standard models the inputs are of TTL-type (Low: 0 V...+0.8 V; High: +2.0 V...+5.5 V), which require a reference to PC ground (PC_GND) and are assembled with pull-up resistors on the board. On models with option „-O" the IRQ inputs are opto-isolated and designed for 24 V level (Low: 0 V...+12 V; High: +13 V...+24 V). The ground reference must refer to pin 45 (GND_IRQ).

As soon as a positive edge occurs an interrupt is initiated (condition: interrupt enabled by software). The interrupt sources are processed sequentially.
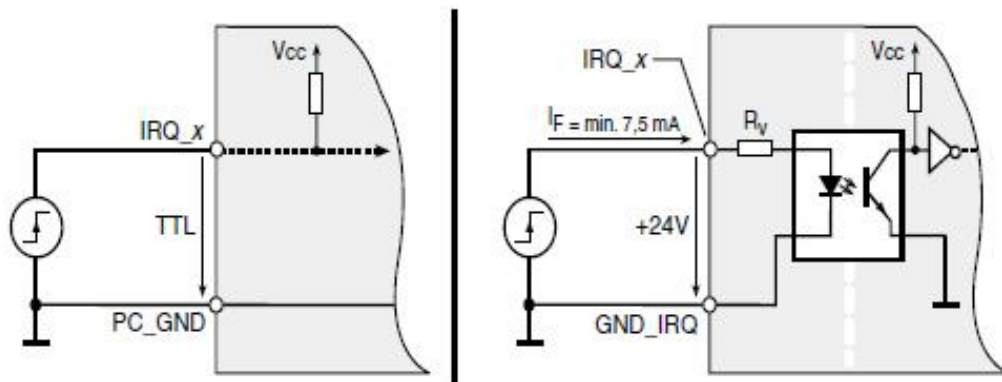

Diagram 12: Wiring of the TTL (left) and opto-isolated (right) interrupt inputs

4   Programming

For programming the device please use the Meilhaus Electronic Intelligent Driver System (ME-iDS) included in your package. The ME-iDS is a unique driver system covering different devices and operating systems. It supports Windows 2000 and higher and contains a universal function library (API) for all common programming languages (the extent of the current software support can be found in the README-files of the ME-iDS).

A detailed description of the functions can be found in the ME-iDS manual (see CD/DVD enclosed or online: www.meilhaus.de/download/ME-iDS.

Further details regarding the assignment of the subdevices and device specific arguments can be found in the help file (help file format under Windows, *.chm) which can be accessed via the „ME-iDS Control Center" in the info area of the task bar (as a rule in the lower right corner of the screen) or via the Windows start menu.

If you do not want to program your board with the ME-iDS but with the legacy driver you can find the last revision of the old function reference in the ME-630 manual Rev. 2.3 (see: www.meilhaus.com/download/ME-630). Please note that we cannot support this driver anymore.

4.1   Relays

ME-630/*x* „Standard"	ME-630/*x*-O
PCI, PCIe, cPCI	PCI, PCIe, cPCI

Depending on the model, the ME-630 provides 8 or 16 relays of type C. Excitation is done in operation mode „**Single**". The relays are accessed as a subdevice of type ME_TYPE_DO, subtype ME_SUBTYPE_SINGLE. Note the order of operation as described in the ME-iDS manual. The following parameters can be configured by the functions *meIOSingleConfig* and *meIOSingle*:

- Determine subdevice with meQuery…functions
- Choose the option ME_SINGLE_CONFIG_DIO_OUTPUT in para-meter `<SingleConfig>` of the function *meIOSingleConfig*.0.

- The relays can be accessed separately or all in common (see parameter iFlags).

If the computer is powered down and after power-up the common contacts (COM_x) are connected with the normally closed contacts (NC_x).

Note: The relay control registers can also be read! But you can also check the actual switching status by the opto-isolated inputs of the ME-630.

For wiring the relays refer to chapter 3.3 on page 15.

4.2   Digital-I/O Section

ME-630/*x* „Standard"	**ME-630/*x*-O**
PCI, PCIe, cPCI	PCI, PCIe, cPCI

Each of the four digital ports of the ME-630 series is considered as an independent subdevice. Port A and B are always input ports whereas the TTL-ports C and D are bi-directional. The assignment of the ports to the subdevices can be found in the ME-iDS help file (see ME-iDS Control Center).

The input/output of single digital values is done in operation mode „Single". Each digital port is accessed as a subdevice of type ME_TYPE_DI (Port A, B) resp. ME_TYPE_DIO (Port C, D), subtype ME_SUBTYPE_SINGLE. Note the order of operation as described in the ME-iDS manual. The following parameters can be configured by the functions *meIOSingleConfig()* and *meIO-Single()*:

- Determine subdevice with *meQuery...* functions.
- Port direction: input or output, if not fixed by opto-isolation.
- Port width: bit or byte operation (8 bit).

Note: Ports defined as output can also be read back!

For wiring the digital ports please read chapter 3.4 on page 18.

4.3   External Interrupt

ME-630/*x* „**Standard**"	**ME-630**/*x*-**O**
PCI, PCIe, cPCI	PCI, PCIe, cPCI

At both external interrupt inputs (IRQ_1, pin 64 and IRQ_2, pin 65) you can initiate an interrupt by a rising edge, which is sent to the PCI-bus directly.

Programming is done by the *meIOIrq...* functions. Each of both interrupt channels is considered to be an independent subdevice of type ME_TYPE_EXT_IRQ (IRQ_1: subdevice 5, IRQ_2: subdevice 6). After enabling the external interrupt by the function *meIOIrqStart()* an interrupt can be triggered by a rising edge. Note the order of operation as described in the ME-iDS manual.

For wiring the interrupt channels please read chapter 3.5 on page 21.

5 Appendix

A Specification

PC Interface

Bus system	PCI-Bus (32 bit, 33 MHz)
(depends on model)	CompactPCI bus (32 bit, 33 MHz) PCI-Express x1, Specification Rev. 2.0
Plug&Play operation	fully supported

Relays

Number	8 resp. 16 form C relays
Relay type	NAIS APE3005 or compatible compliant with EN 60255, EN 60335, EN 60730, EN 60950, EN 60065, EN 50178
Permanent load	DC: max. 30 VDC/2 A; AC: max. 30 VAC/2 A
Peak load	short time up to 30 V/3.5 A (see also chapter "3.3 Relays")
Resistance per relay channel type	typ. 200 mΩ; max. 250 mΩ
Isolation resistance	min. 103 MΩ at 500 VDC
Breakdown voltage	contact to contact: 1.000 V contact to coil: 4.000 V
Operating time	ca. 5 ms (depends on contact rating)
Release time	ca. 3 ms (depends on contact rating)
Switching cycles	> 5 x 106
Monitoring	Relay registers can be read back by software.

Digital Inputs (TTL)

Number	8 (only ME-630 „Standard")
Input level (TTL)	low: 0 V...+ 0.8 V ($I_{IL\ max.} = \pm 10\,\mu A$)
	high: + 2.0 V...+5.5 V ($I_{IH\ max.} = \pm 10\,\mu A$)
Reference to ground	PC ground (PC_GND)

Digital Inputs (opto-isolated)

Number	ME-630 "Standard": 8 ME-630 "-O": 16
Input level	low: 0 V…+ 12 V high: + 13 V…+ 24 V
Input current	typ. 7.5 mA at 24 V
Isolation voltage	500 VDC
Signal frequency	max. 1 kHz
Reference to ground	ground of the appropriate channel group (GND…)

Bidirectional Digital I/Os(TTL)

Ports	2 x 8 bit
Reference to ground	PC ground (PC_GND)
Port type	bidirectional TTL ports
Output level	
UOL	max.0.5 V at 24 mA
UOH	min. 2.4 V at -24 mA
Input level	
UIL	max. 0.8 V at Vcc = 5 V
UIH	min. 2 V at Vcc = 5 V
Input current	$\pm 1 \mu A$

Interrupt Channels (PCI-/PCIe-/cPCI-models)

Number	2
Input level	ME-630/x „Standard": see TTL inputs ME-630/x-O: see opto-isolated inputs
Reference to ground	ME-630/x „Standard": PC_GND ME-630/x-O: GND_IRQ

General Information (PCI/PCIe/cPCI models)

Power consumption at +5 V	typ. 850 mA (16 relays)
Physical size (without mounting bracket and connector)	
	ME-630 PCI: 174 mm x 98 mm

	ME-630 PCIe: 167.65 mm x 111.15 mm
	ME-630 cPCI: 3U CompactPCI board
Connectors	78-pin D-Sub female connector ST1; 25-pin D-Sub female connector ST2 (by extra mounting bracket)

Common Specifications

Operating temperature	0...70 °C
Storage temperature	-40...100 °C
Relative humidity	20...55 % (non-condensing)

Certification	CE

B   Pinout

| NC_*x*	break contact relay (normally closed)
NO_*x*	make contact relay (normally open)
COM_*x*	common relay contact (COMmon)
DI_A*x*	digital input port A (ME-630 „Standard": TTL, ME-630 „-O": opto-isolated)
DI_B*x*	digital input port B (opto-isolated)
DIO_C*x*	bidirectional TTL port C
DIO_D*x*	bidirectional TTL port D
IRQ_1	interrupt channel 1 (TTL resp. opto-isolated)
IRQ_2	interrupt channel 2 (TTL resp. opto-isolated)
GND_A0_3	ME-630 „-O": reference to ground for opto-isolated inputs DI_A0...3
GND_A4_7	ME-630 „-O": reference to ground for opto-isolated inputs DI_A4...7
GND_B0_3	ME-630 „-O": reference to ground for opto-isolated inputs DI_B0...3
GND_B4_7	ME-630 „-O": reference to ground for opto-isolated inputs DI_B4...7
GND_B0_7	ME-630 „Standard": reference to ground for opto-isolated inputs DI_B0...7
GND_IRQ	ME-630 „-O": reference to ground for opto-isolated interrupt inputs IRQ_*x*
PC_GND	PC ground
VCC_OUT	V_{CC} output (PCI, cPCI: +5 V, PCI-Express: +3.3 V) max. 200 mA load
n.c.	pin not connected

B1 78-pin D-Sub (ST1) – ME-630 "Standard" PCI, cPCI
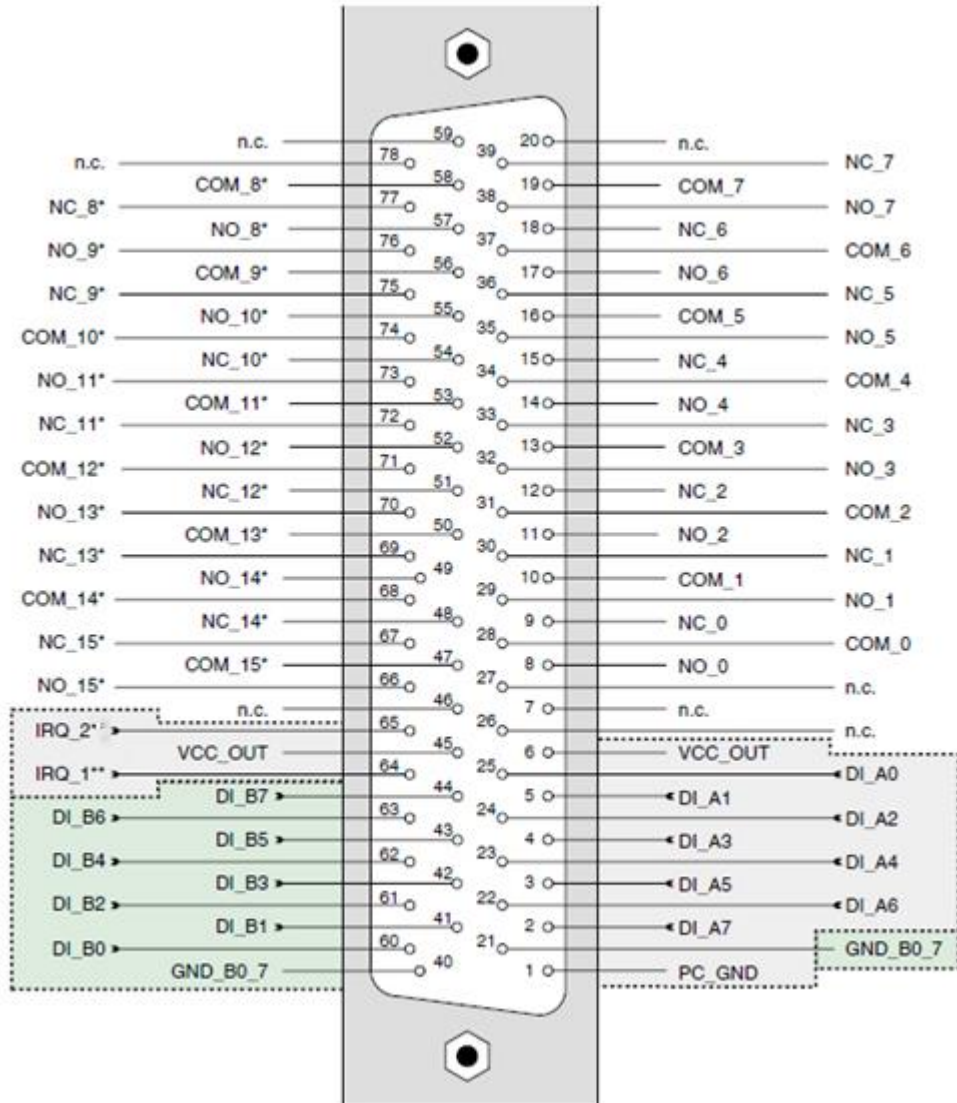
Diagram 13: Pinout of the 78-pin D-Sub female connector

*The pins of the relays 8…15 are not connected on the ME-630/8.

Signals shaded with the same color use a common reference to ground.
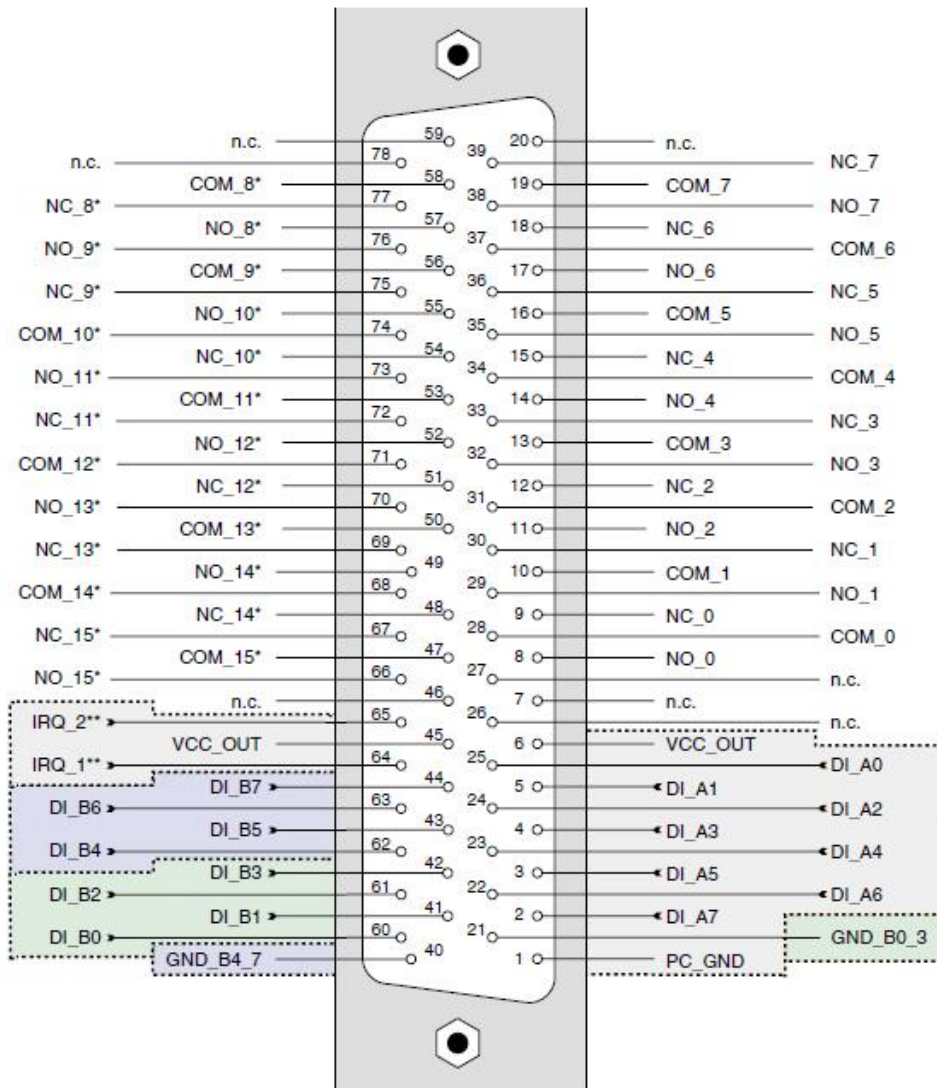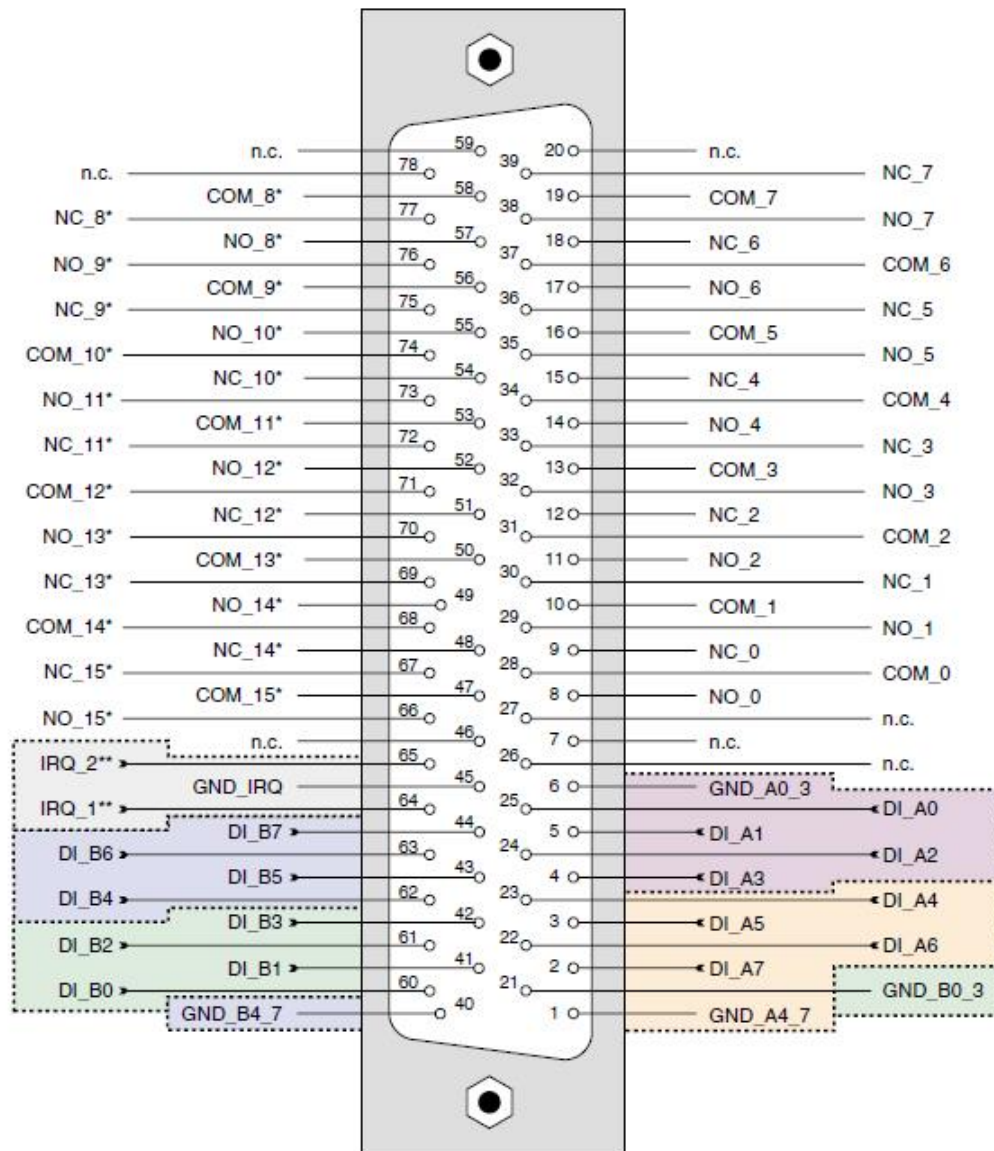
B2 78-pin D-Sub (ST1) – ME-630 "Standard" PCIe

Diagram 14: Pinout of the 78-pin D-Sub female connector

*The pins of the relays 8…15 are not connected on the ME-630/8.

Signals shaded with the same color use a common reference to ground.

B3   78-pin D-Sub (ST1) – ME-630/x-0

Diagram 15: Pinout of the 78-pin D-Sub female connector

*The pins of the relays 8...15 are not connected on the ME-630/8.

Signals shaded with the same color use a common reference to ground.

B4   Auxiliary Connector (ST2)

Note: For the PCI-, PCIe- and CompactPCI-models an extra mounting bracket with an adapter cable from 20-pin IDC-connector to 25-pin D-Sub female connector is required (comes with the board).
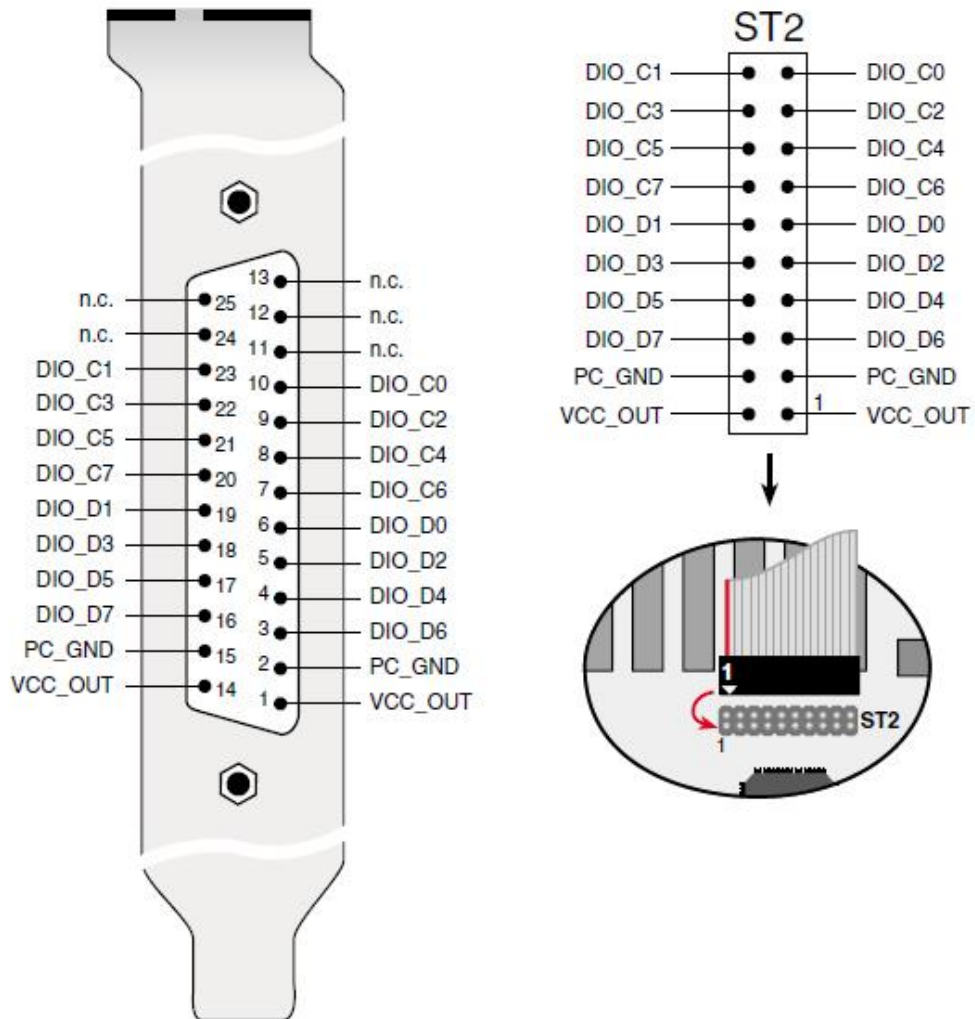

Diagram 16: Auxiliary connector ST2 for ME-630 (top view)

Attention: When connecting the mounting bracket make sure to plug in pin 1 of the flat ribbon cable (red marked line) as shown above to the IDC connector ST2.

C   Accessories

We recommend to use high-quality connector cables with single-shielded lines per channel.

For further accessories please refer to the current Meilhaus Electronic catalog and the internet:
www.meilhaus.de/en/pc-boards/accessories/

D   Technical Questions

D1   Hotline

Should you have questions or inquiries concerning your Meilhaus device, please contact us:

Meilhaus Electronic GmbH
Repair & Service
Am Sonnenlicht 2
D-82239 Alling

Sales:		**Support:**	
Tel.:	(08141) 52 71 – 0	Tel.:	(08141) 52 71 – 188
Fax:	(08141) 52 71 – 129	Fax:	(08141) 52 71 – 169
eMail:	sales@meilhaus.de	eMail:	support@meilhaus.de

Download-Server and Driver Update:
To download current driver versions for Meilhaus Electronic devices as well as manuals in PDF format, please go to:
www.meilhaus.org/driver

Service Department with RMA Process:
In case you need to return a board for repair purposes, we strongly ask you attach a detailed description of the error as well as information regarding your computer/system and the software used. Please register online using our RMA process:
www.meilhaus.de/en/infos/service/rma.htm.

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