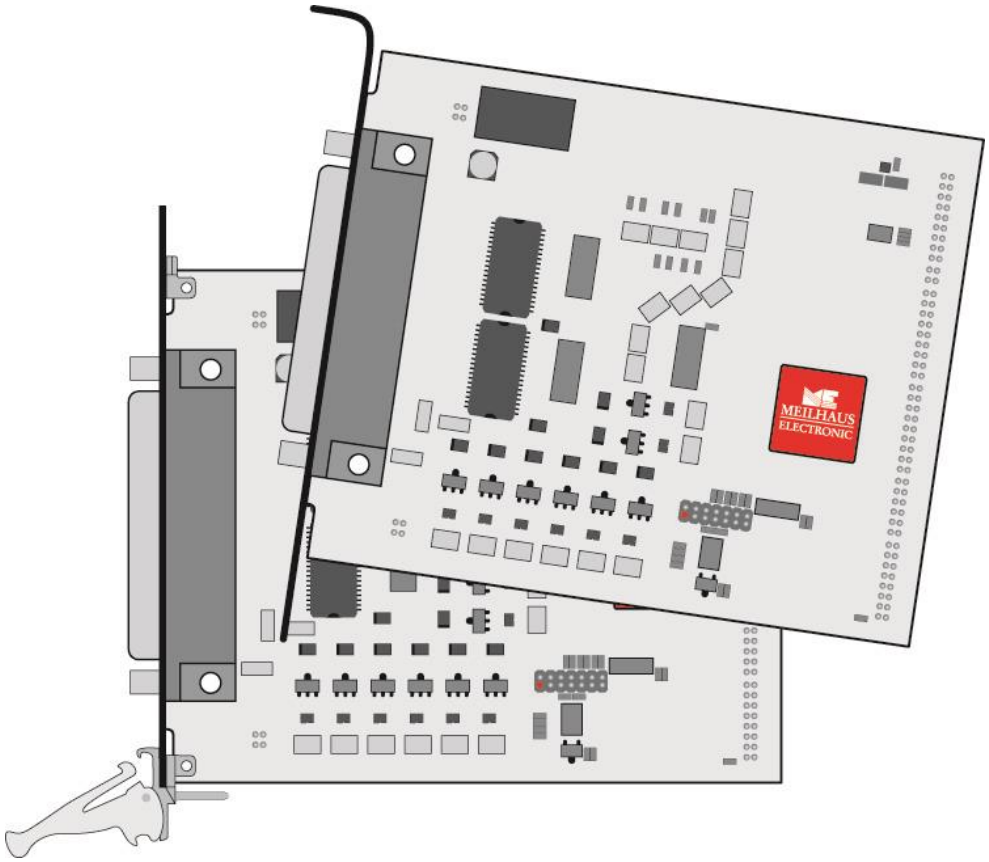
MEILHAUS ELECTRONIC

Meilhaus Electronic Manual

ME-5004 3.0E



Plug-on Board for ME-5000 Series

with Opto-Isolated Digital I/Os

(Alternative Configuration: Frequency Measurement and Pulse Generator)

Imprint

Manual ME-5004

Revision 3.0E

Revised: 2019-11-27

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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.

1.1 Important Notes

1.1.1 Use in Accordance with the Requirements

The plug-on boards of the ME-5000 series require a base board of the ME-5000 series and will be plugged onto these and extend the functionality of the base boards. Depending on the PC platform the plug-on board additionally needs:

a free PCI-Express slot (PCIe) or

a free CompactPCI slot (cPCI)

however, without using the PCI slot connector.

Please follow the instructions of chapter 2.3 on page 11 of this document and the manual of your computer for the procedure when fitting additional hardware components.

Please follow the notes and the specifications starting on page 29.

- 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.
- When using the configuration “pulse generator” (FO) unused output pins should not be connected.

- The opto-isolated inputs and outputs provide electrical isolation between device and application of up to 1000 V with respect to the PC ground.
- Note that the computer must be powered up, prior 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 when handling the board or when 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 the 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. As power supply for the USB models only an authorized power adaptor may be used.

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:

- Opto-isolated digital-I/O board used as a plug-on board for the base boards of the ME-5000 series.
- Manual in PDF format on CD/DVD.
- Driver software on CD/DVD.
- 37-pin D-Sub mating connector.

1.3 Features

The plug-on board of type ME-5004 is an opto-isolated digital-I/O board with bit-pattern detection for the base boards of the ME-5000 series. You can configure individual subdevices alternatively for frequency measurement resp. pulse generator on demand (see chapter 4 from page 21).

Overview

Model	DIO	FIO*	Sink/ Source	Bit-Pattern
ME-5004 (Subdevice 0)	16-bit DI (opto-isolated	8 FI channels (opto-isolated)	-	- change - compare
(Subdevice 1)	16-bit DO (opto-isolated	8 FO channels (opto-isolated)	✓	-

Table 1: Model overview ME-5004

*Alternative configuration can be activated via ME-iDC.

- **Opto-isolated digital-inputs:** The ME-5004 has 16 opto-isolated inputs (subdevice 0). The inputs run with a voltage high-level of 24 V typ. (specifications see page 29).
- **Opto-isolated digital-outputs:** The ME-5004 has 16 opto-isolated outputs (subdevice 1). The source-driver can drive up to 500 mA per pin. The detailed specifications of the sink and /or source drivers can be found on page 15.
  The source drivers are short-circuit-proof and are equipped with a current limiting per channel. If required, the output driver can send an interrupt on overload to the PC.
  A suitable external source is required to supply the output drivers.

- **Frequency counter:** With the concept of "configurable subdevices" the subdevice 0 can also be used as a frequency counter. Eight independent channels are available to measure the frequency and duty cycle of periodic rectangular signals (max. 300 kHz).
- **Pulse generator:** With the concept of "configurable subdevices" the subdevice 1 can also be used as a rectangular signal generator. Eight independent channels are available to output a periodic rectangular signal up to 3 kHz with selectable duty cycle.
- **Sink/source selection:** You can switch the output ports over from sink to source drivers or high impedance by software for an optimal adaption in industrial applications. "High impedance" means that the voltage level at the output pin depends on your external application.
- **Bit-pattern detection:** If required, the bit-pattern of a digital input port can be monitored. Depending on the mode an interrupt can be generated, if the bit-pattern changes or is equal/ not equal to a given bit-pattern.
- The **isolation voltage** between the opto-isolated inputs/outputs and PC ground is 1 $kVAC_{RMS}$.
- The opto-isolated **digital inputs** of the ME-5004 are equipped with an overvoltage protection diode that can discharge voltage pulses to ground for a short period of time.

For data transmission between PC memory and the base board the ME-5004 must share the bandwidth with the base board. The actual transmission rate depends on the operating mode and on the configuration of your PC.

Depending on requirements, you can select from the following operating modes:

- **Single:** In this operating mode, a single value can be read or written under software control (see chapter 4.1 on page 22).
- **Interrupt:** For interrupt handling in the "bit-pattern change" and "bit-pattern compare" modes (see chapter 4.2 on page 25).

1.4 System Requirements

The plug-on board requires a base board of the ME-5000 series and occupies a free PCI-Express- or CompactPCI-slot, however without using the PCI-slot-connector. This saves the resources of

your PC. 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 Test Program

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

2.3 Fitting the Plug-on Boards

The boards should be handled with care in order to make sure that the device is not damaged by electrostatic discharge (ESD), mechanical stress or unsuitable current surges. Precautions should also be taken to avoid an electric shock. Ensure that standard ESD safety precautions are taken. At least one hand should be grounded in order to dissipate any static charge.

Observe the following procedure:

1. If the base board is installed, you must first remove it in order to be able to insert the plug-on board. Here you should observe the procedure as described in the manual for your PC system.
2. Make sure that electrostatic discharges cannot take place through the plug-on board or the base board as you plug it in. Follow the standard ESD safety precautions.
3. Push the plug-on board carefully, and with only a little force, on to the male connector provided for it (see Diagram 1 , items 1, 2 and 3). Check that the board is fully plugged in.
4. Choose two adjacent slots for the installation. If necessary, remove an additional mounting bracket for the slot of the plug-on board.
5. Carefully plug the combination of the base and plug-on board into the computer.
6. Screw the two slot brackets down firmly.
7. Close the PC system again.

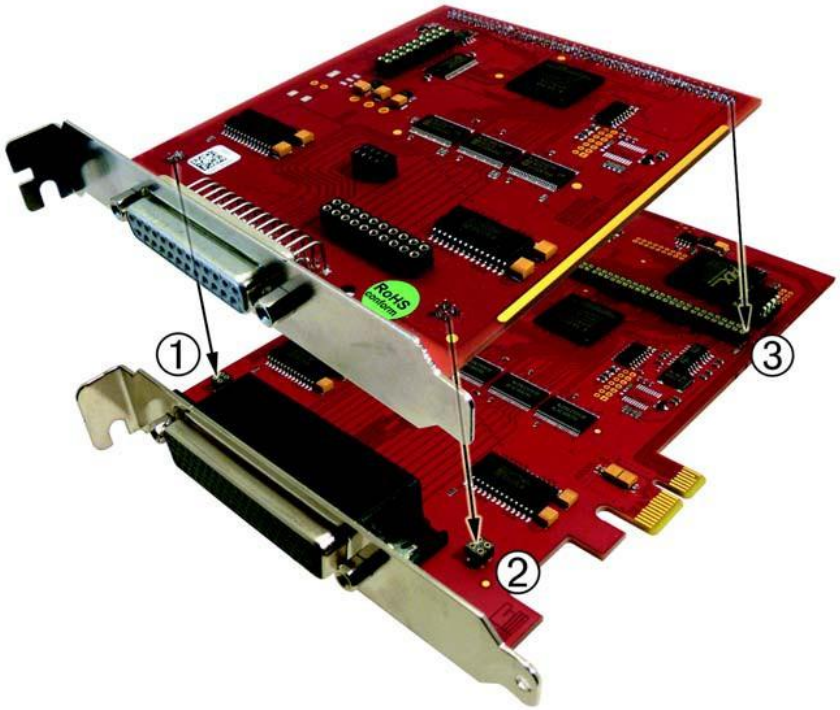

Diagram 1: Fitting the plug-on boards

3 Hardware

3.1 Block Diagram

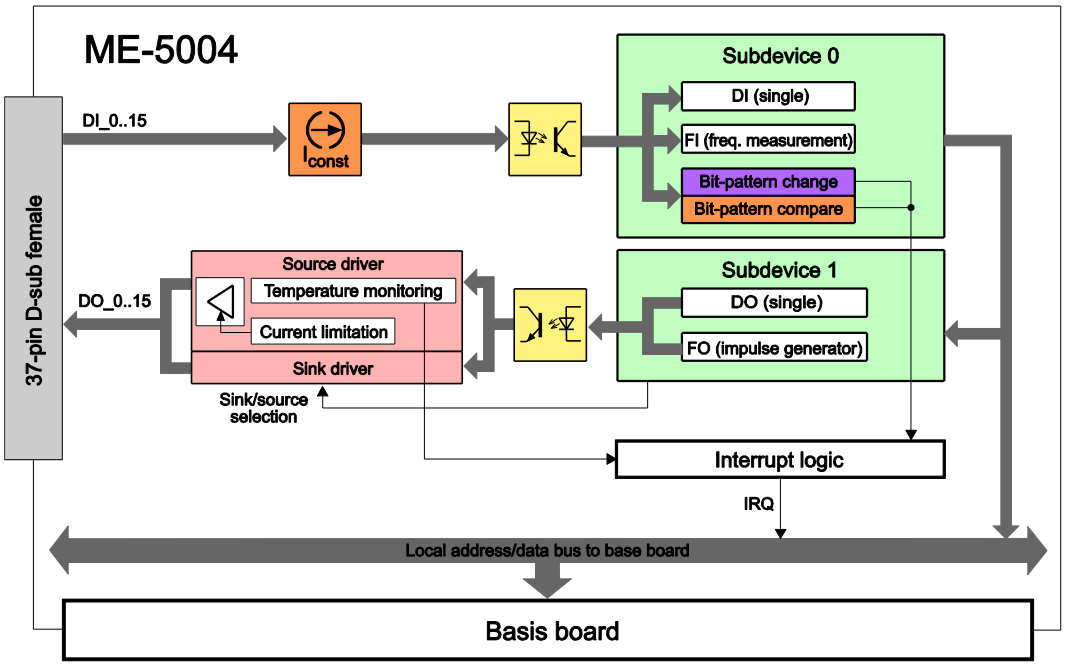

Diagram 2: Block diagram of the ME-5004

Pinout diagram of the 37-pin D-sub female connector in the appendix (see “Pinout” on page 35).

In the following chapters you will learn more about the external wiring of the individual subdevices. Chapter 4 from page 21 describes the operation modes and the programming.

3.2 ME-5004 cPCI/PCIe

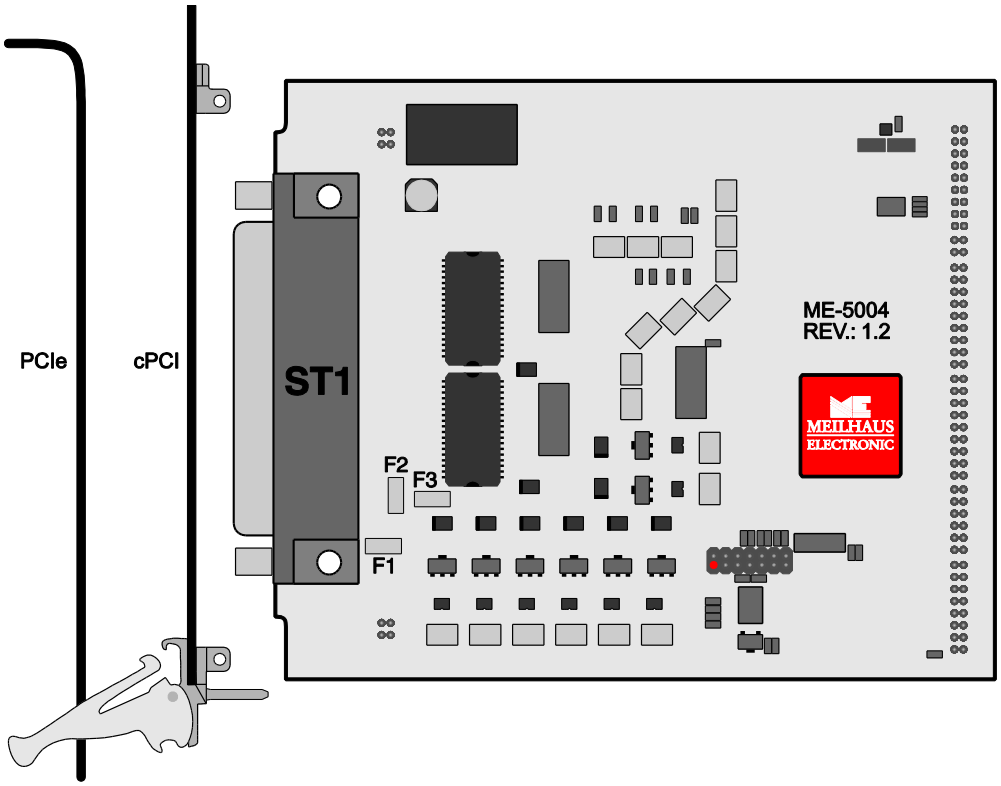

Diagram 3: ME-5004 cPCI/PCIe

3.3 Digital Input/Output

The opto-isolated inputs and outputs have been designed for applications in industrial control applications (typ. 24 V). An external power supply (pin: VCC_EXT) is required for the opto-isolated digital outputs. Depending on the application, the drivers of the output ports can be configured as sink or source or high impedance via software. The isolation voltage to PC ground is 1000 VAC_{RMS}.

The plug-on board of type ME-5004 has 16 opto-isolated inputs and 16 opto-isolated outputs. Due to the opto-isolation, the port direction is fixed.

The programming of the various operating modes is described in chapter 4.1 from page 22.

3.3.1 Opto-Isolated Inputs

The ME-5004 has 16 opto-isolated inputs which have been designed for an input high-level $U_{in,H}$ typ. 24 V. A reference to the ground of the external circuitry via GND_EXT (pins 15) has to be setup in any case. The input lines show logic "0" if not connected.

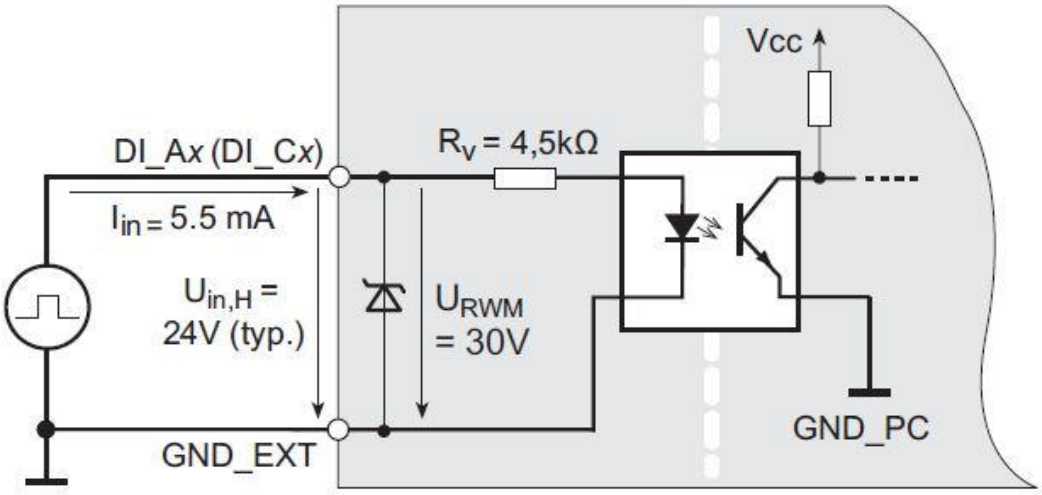

Diagram 4: Inputs of the ME-5004

The opto-isolated digital-inputs of the ME-5004 are protected from over-voltages with special Z-diodes, so called Transient Voltage Suppressor diodes (TVS diodes). These diodes can discharge short voltage pulses with URWM (Reverse Working Maximum) greater than 30 V to ground (max. 600 W pulse power at a pulse width of 1 ms).

3.3.2 Opto-Isolated Outputs

The ME-5004 has 16 opto-isolated outputs. The output port is equipped with special driver chips that allow a selection of sink and source via software. Depending on the application, the user can switch between low-active outputs (sink driver = standard setting) and high-active outputs (source driver) via software. Moreover, the outputs can be set to high impedance port-wise. A reference to the ground of the external wiring via GND_DO (pin 21) has to be setup in any case.

3.3.2.1 Sink Driver

Each output port is equipped with two sink driver chips of type ULN2803; detailed specifications see page 29.

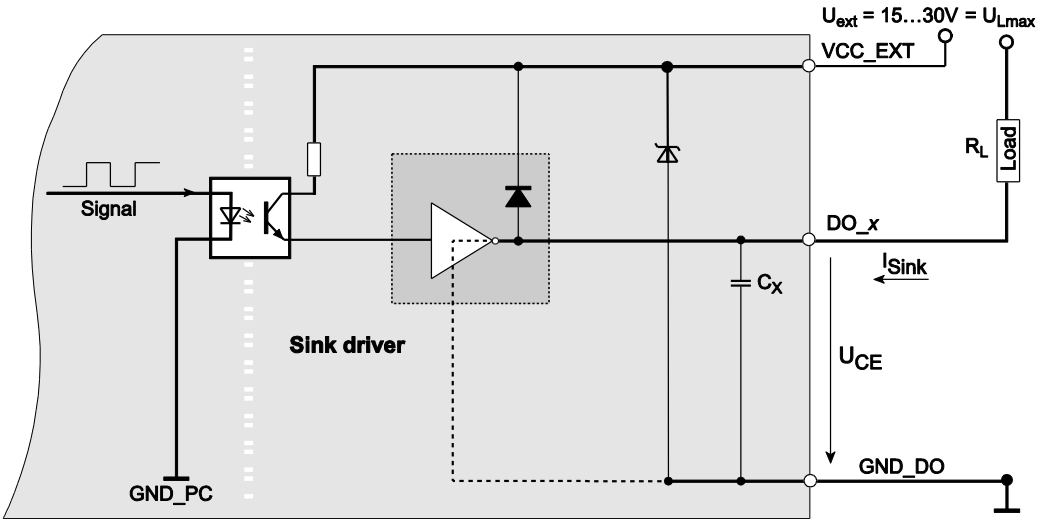

Diagram 5: ME-5004 outputs with sink drivers

The maximum current per output ($I_C = I_{Sink}$) depend on the saturation voltage U_{CE} and is limited by the power loss of the sum of the channels on P_{tot} = 1 W per chip (DO_0...7 = chip 1, DO_8...15 = chip 2), see Diagram 6 and Diagram 7.

$P_{tot} = P_0 + \ldots + P_7 \leq 1$ W (per chip at 70 °C)

with $P_0 = I_{C0} \times U_{CE0}$

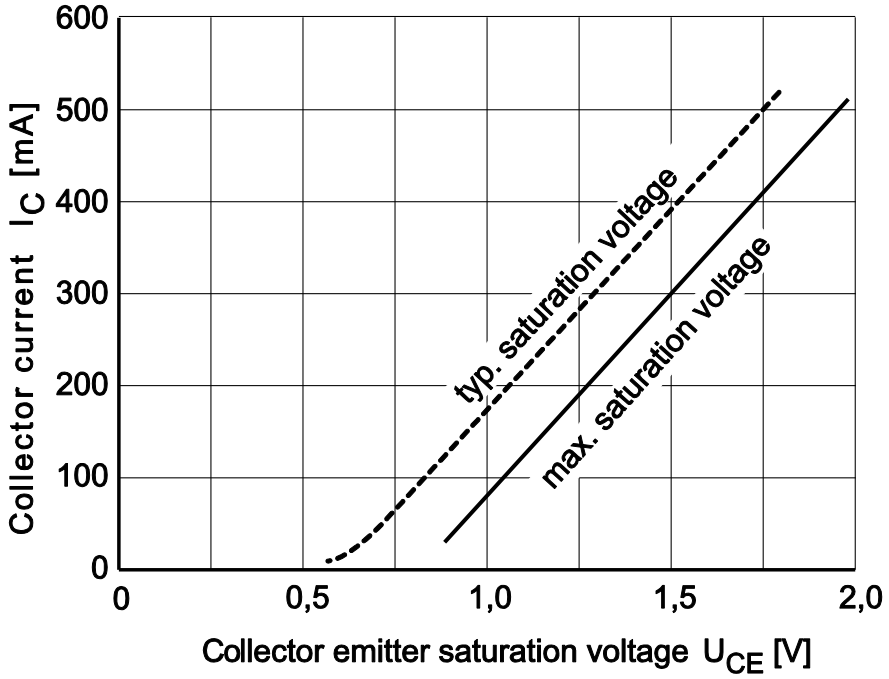

Diagram 6: Collector current against saturation voltage

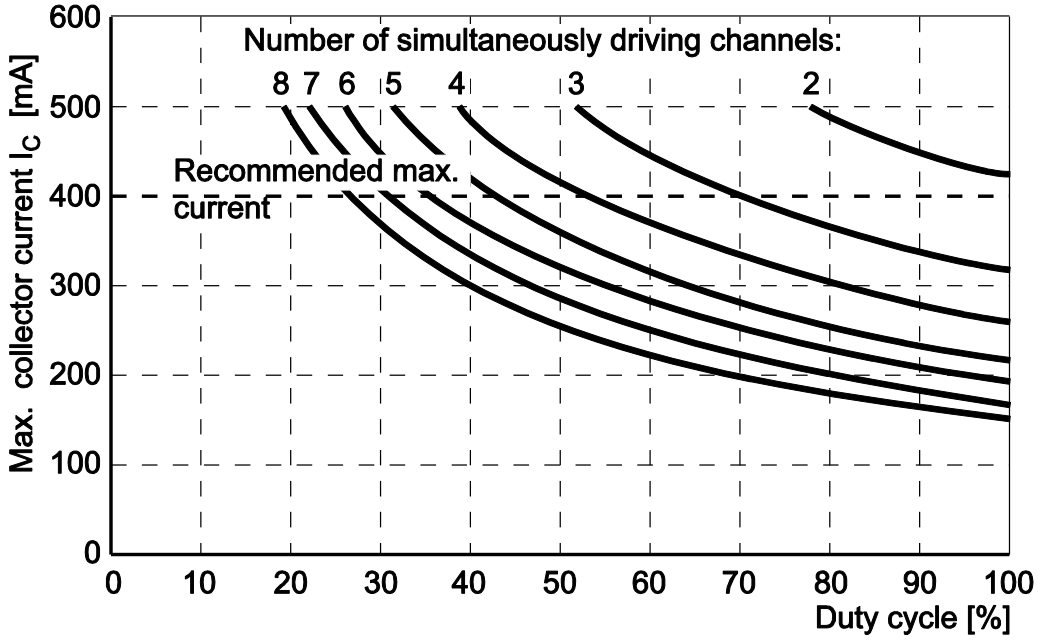

Diagram 7: Collector current against duty cycle and number of active channels in use

To supply the sink output drivers, an external power supply has to be connected to VCC_EXT (Pin 1, 2, 20) with sufficient power (depending on the application). At full load this means up to 0.5 A per channel for the ME-5004.

3.3.2.2 Source Driver

Each input port is equipped with two source driver chips of type ISO2H811G; detailed specifications see page 29.

The source output drivers are short-circuit-proof and are equipped with a current limiting per channel. The combination of current limiting, thermal shutdown, and automatic re-start protects the circuitry against overload. In the case of an overload condition (T_{TSD} = typ. 175 °C) the related channel will switch off and on again automatically, as soon as the junction temperature has fallen below the threshold of T_R = 135 °C). If a chip temperature of typ. 130 °C is still exceeded, the overloaded channel remains disabled and is only reactivated, if the temperature decreases below T_{CR} = 110 °C. Channels in standard (no overload) condition can be used at any time without restrictions. In the case of an overload condition the output driver (per port) can send an interrupt to the PC. A further security feature is a complete disabling of a port in case of a missing ground connection.

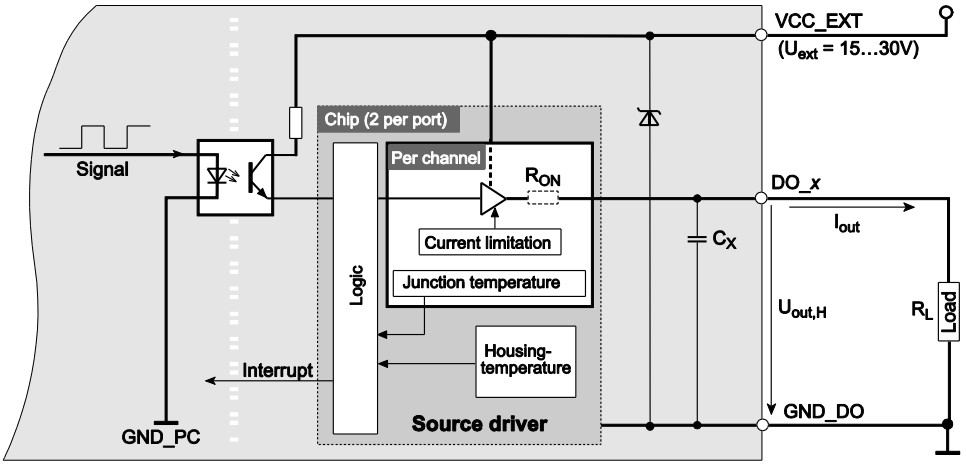

Diagram 8: ME-5004 outputs with source drivers

The following table shows the maximum output current I_{Out} in dependency of the number of channels in use:

Number of Channels Used	1	16
I_{Out} [A]	0.625 A	0.5 A

Table 2: Max. current of the source drivers

To supply the source output drivers, an external power source has to be connected to VCC_EXT (pins 1, 2, 20), with sufficient power (depending on the application). At full load this means up to 9 A for the ME-5004. The output voltage $U_{out,H}$ can be calculated like this:

$$U_{out,H} = U_{ext} - (R_{ON} \times I_{out})$$

3.3.3 External Trigger

On the ME-5004 no external trigger inputs are available. However you can monitor the digital inputs on bit-pattern change and bit-pattern compare. As soon as the specified event occurs, an interrupt can be issued and passed directly to the PC. See chapter 4.2 on page 25.

3.4 Frequency Input/Output

With the concept of "configurable subdevices" on the ME-5000 series boards you can use certain subdevices with an alternative functionality. The configuration tool ME-iDC is used to change the configuration before the user application is started:

The following channels are available:

- Frequency measurement (FI="Frequency Input"):
  8 independent inputs for measuring the frequency and duty cycle of rectangular signals (max. 300 kHz).
- Pulse generator (FO="Frequency Output"):
  8 independent outputs for a periodic rectangular signal at up to 3 kHz with a variable duty cycle.

The related pins are marked with FI_*x* and FO_*x* in the pinout diagram on page 35. The remaining I/O-channels of the digital ports cannot be used in this configuration:

Note: For the configuration "pulse generator" (FO) take care of the level at the unused pins DO_8..15. When used as sink drivers the outputs are in a high-impedance state, when used as source drivers they are connected to ground!

The specifications of the digital-I/O ports also apply to the FI/FO lines. For all inputs and outputs a reference to the ground of external wiring has to be setup in any case. For the frequency measurement inputs this is the ground of the digital input section (GND_DI, pin 15) and for the pulse generator outputs this is the ground of the digital output section (GND_DO, pin 21).

The frequency counters and pulse generators are configured via software. Chapter 4.1.2 on page 23 describes the programming of the frequency I/Os.

3.5 External Interrupt

If required, you can also monitor the bit-pattern of a digital input port. You can select one of the modes “bit-pattern change” and “Bit-pattern compare”. As soon as the specified event occurs, an interrupt is issued and passed directly to the PC.

The digital inputs/outputs are programmed in the single operating mode. The interrupt handling is carried out with the *meIOIrq...*functions; see also chapter 4.2 on page 25.

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.

Subdevice Configurations ME-5004

Subdevice Type...	...Subtype	I/Os	ID of the Configuration
Subdevice 0 (DI, FI)			
Digital input (DI)	single	16 inputs	0*
Frequency input (FI)	single	8 channels	1
Subdevice 1 (DO, FO)			
Digital output (DO)	single	16 outputs	0*
Frequency output (FO)	single	8 channels	1

Table 3: Subdevice configuration ME-5004

*Standard configuration at shipment. The most recently selected configuration in the ME-iDC is stored in a non-volatile memory on the board, and is automatically loaded after a restart.

Depending on requirements, you can select from the following operation modes:

- **Single:** Individual values can be read or written in this operating mode.
- **Interrupt:** For the interrupt handling in the bit-pattern change mode (see chapter 4.2.1 starting on page 26).

Operation Mode	Speed	Trigger
Single	single value	input/output via software
Interrupt (bit-pattern detection)	$f_{IRQmax.}$ = 10 kHz	ext. trigger signal at a digital input/output port

Table 4: Operation modes overview

4.1 Single Operation Mode

Individual values can be read or written in this operating mode.

Notes:

- The digital-I/O channels direction is determined by the ME-5004 series hardware (opto-couplers).
- In power-down state and after switching on the PC all outputs are in a high-impedance state. Only if "1" is written, the output changes to conductive.
- A port that is configured as an output can also be read back!

4.1.1 Digital Input/Output

ME-5004
✓

For input/output of individual digital values the single operation mode is used. The subdevices are defined as follows: subdevice 0 is always of type ME_TYPE_DI and subdevice 1 of type ME_TYPE_DO. The sub-type is always ME-SUBTYPE_SINGLE.

Diagram 9: Digital input/output in single operation mode

Please observe the ME-iDS manual and the ME-iDS help file (*.chm) for the procedure. You can open both these documents through the “ME-iDS Control Center” or through the Windows Start menu.

Please read chapter 3.3 on page 19 for wiring of the digital I/Os.

4.1.2 Frequency Input/Output

ME-5004
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Before you can use the “Frequency measurement” or “Pulse generator” modes, it is necessary, before opening your application, to run the ME-iDC configuration tool in order to specify the configuration for the corresponding subdevice (see also table 3 on page 21).

The programming of the frequency measurement and the pulse generator is always done in the single operating mode. The subtype of the subdevices is always ME-SUBTYPE_SINGLE.

Diagram 10: Frequency input/output in single operation mode

Please read the ME-iDS manual and the ME-iDS help file (*.chm) carefully prior to programming. You can open both of these documents through the "ME-iDS Control Center" or through the Windows Start menu.

Two variables are introduced to describe the rectangular signal, and apply equally to input and output. One value indicates the period T, while the other value provides the duration of the pulse of the first phase of the period t_{1p}. For frequency measurement, the measurement starts with the first rising edge, and finishes with the next rising edge. The falling edge that lies between them defines the end of the first phase. In pulse generator mode, output normally starts with a high level, changing to the low level when the first phase has elapsed.

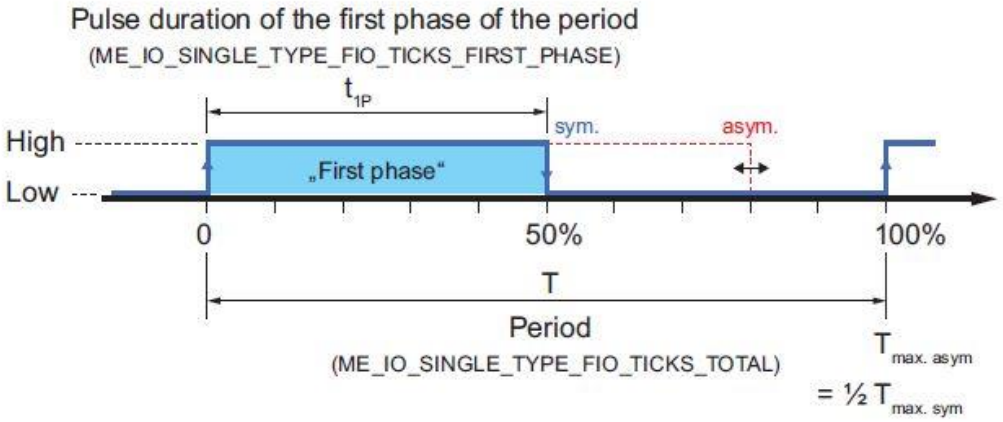

Diagram 11: Signal definition

The time reference is provided by a 66 MHz counter. It is configured using the *melOSingleConfig()* function. A period of 15.$\overline{15}$ ns follows from this, and is defined as the smallest unit of time. It is referred to below as "1 tick". The resolution for T and t_{1P} is therefore 1 tick (see also the specifications on page 29).

Note that the value of the maximum period $T_{max.}$ depends on the duty cycle. A distinction is drawn between rectangular signals with an asymmetrical duty cycle $T_{max.\ asym.}$ and a symmetrical duty cycle $T_{max.\ sym.}$ The figures for the ME-5004 are:

$T_{max.\ asym.}$ = 16.25 s (0.06 Hz); $T_{max.\ sym.}$ = 32.5 s (0.03 Hz)

The wiring of the frequency inputs/outputs corresponds to the digital-I/Os. See chapter 3.3 on page 14.

4.1.2.1 Frequency Measurement

With the frequency measurement operating mode (FI="Frequency Input") you can determine the period or frequency, and the duty cycle of rectangular signals up to about 300 kHz. The resolution is 1 tick = 15.$\overline{15}$ ns. The measurement always starts at a rising edge. All 8 frequency measuring channels (FI_0...7) are addressed as subdevices of type ME_TYPE_FI, sub-type ME_SUBTYPE_SINGLE. Each channel can be programmed independently

In combination with the plug-on board ME-5002, 8 additional frequency measurement channels (FI_C0...7) are available which can be addressed as one subdevice.

Note: If the frequency and duty cycle are the magnitudes you want, these can easily be calculated from the values returned for `<pdTime>`. The formula is:

Frequency [Hz] = 1/period [s]

Duty cycle [%] = („duration of the first phase of the period" [s]/period [s] x 100.

4.1.2.2 Pulse Generator

In the pulse generator operating mode (FO = "Frequency Output") you can output rectangular signals with a variable duty cycle at frequencies of up to 3 kHz and with a resolution of 1 tick. All 8 pulse generator channels (FO_0...7) are addressed as subdevices of type ME_TYPE_FO, sub-type ME_SUBTYPE_SINGLE. Each channel can be programmed independently

The first phase of the rectangular signal is "high" by default. By setting the ME_IO_SINGLE_TYPE_FO_START_LOW flag it is also possible to start the output with a "low" level.

Note: An output channel can also be read back!

4.2 Interrupt Operation

ME-5004
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On the ME-5004 board you can monitor the bit-pattern of the 16 digital inputs. Depending on the application you can select one of the operating modes “bit-pattern compare” and “bit-pattern-change”. As soons as the first edge that meets the trigger condition arrives, an interrupt is issued and passed directly to the PC.

Programming the digital input/output is carried out in operation mode single. The subdevice must be of type ME_TYPE_DI. The interrupt processing is controlled with the functions *meIOIrq...*

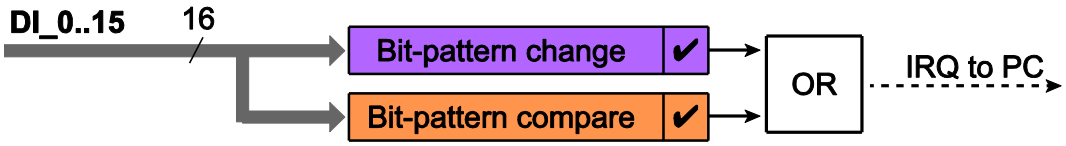

Diagram 12: Interrupt options

Please observe the ME-iDS manual and the ME-iDS help file (*.chm) for the **procedure**. You can open both of these documents through the “ME-iDS Control Center” or through the Windows Start menu.

4.2.1 Bit-Pattern Change

In the bit-pattern change mode, one or more bits that are to be monitored for a change of state can be defined (masked). A 32-bit-wide argument per subdevice contains the mask. For each input pin both one bit for rising edge and one bit for falling edge is available. If the state of at least one bit masked with a “1” changes (0 ⟶ 1 or 1 ⟶ 0), an interrupt is issued (see diagram 13 on page 27).

In what is known as the “extended format” of interrupt handling (see the ME-iDS manual), two bits are available for the interrupt status of each pin. One is for the rising edge, and one for the falling edge. The bits for the falling edges are assigned to the bit b15...0, while the bits for the rising edges are assigned to the bits

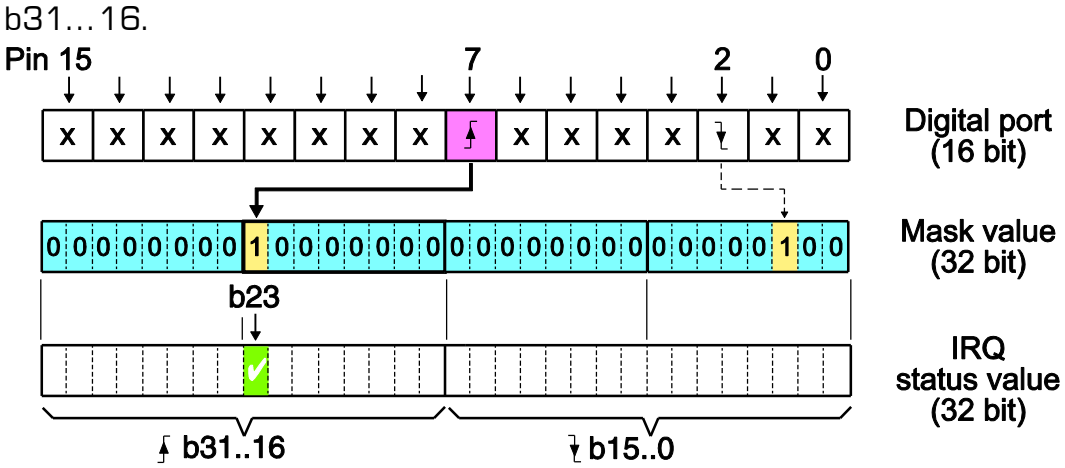

Diagram 13: Bit-pattern change

Example (see diagram 13):

By writing the value 00800004 Hex as a mask value (see parameter `<iIrqArg>` of the function *melOlrqStart(),* bit 2 is monitored for a falling edge, and bit 7 for a rising edge. A rising edge now is to arrive at bit 7, so that an interrupt is issued and in the interrupt status value bit b23 returns "1". Any edges that might arrive at pins labelled with an "X" are ignored. Only the change in state of a pin whose edge is set to "1" in the parameter `<iIrqArg>` can issue an interrupt.

The interrupt event is evaluated with the function *melOlrqWait().* We recommend using what is known as the "extended format" to obtain detailed information about the triggering edge.

4.2.2 Bit-Pattern Compare

In the “bit-pattern compare” mode, the bit-pattern of digital inputs can be monitored for equality or inequality. The compare bit-pattern of the corresponding subdevice is used as reference. If the state changes from inequal or from equal to inequal, an interrupt is generated (see diagram 14 on page 28).

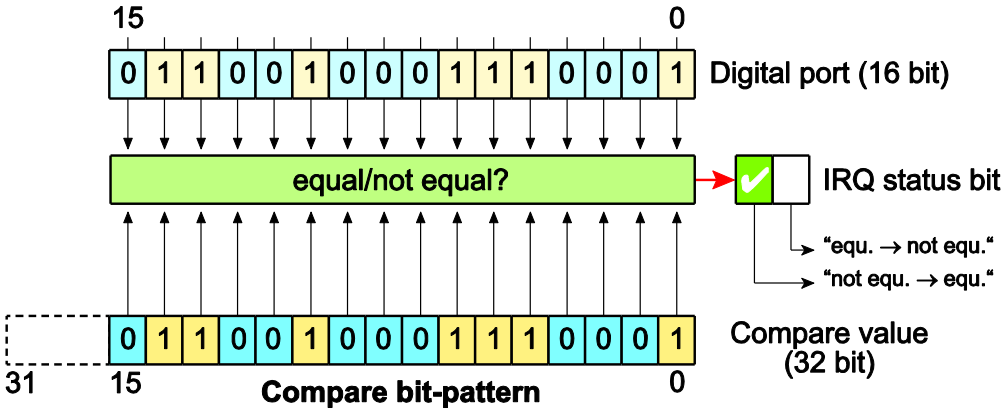

Diagram 14: Bit-pattern compare

5 Appendix

A Specification

(Ambient temperature 25 °C)

PC Interface

PCI-Express-bus	32 bit, 33 MHz, 3.3 V, PCI-Express x 1 specification version 2.0
CompactPCI-bus	32 bit, 33 MHz, 5 V, PICMG 2.0 R3.0
Plug&Play	is fully supported

Digital Input/Output (general)

Measured Quantity	**Condition/ Explanation**	**Value**
Number inputs	subdevice 0 single mode operation	16 bit opto-isolated
Number of outputs	subdevice 1 (Single)	16 bit opto-isolated
Operation modes	Single	Software triggered read/write
	Interrupt	bit-pattern change, bit-pattern compare
Frequency input signal	symmetrical rectangular signal	max. 300 kHz
Frequency output signal	symmetrical rectangular signal	max. 3 kHz
External trigger inputs		DI_0..15, DO_0..15
External trigger edges		rising, falling, any
Input level	see the following tables	
Isolation voltage	U_{ISO} (f=60 Hz, t=60 s)	max. 1000 VAC_{rms}
Reference ground	opto-isolated inputs	GND_DI
	opto-isolated outputs	GND_DO

Opto-Isolated Inputs

Static values

Conditions: T_A = 25 °C

Measured Quantity	Test Criterion	MIN	Type	MAX	Unit
$U_{in,H}$		12	24	30	V
$U_{in,L}$		0		2.2	V
R_{in}	U_{in}=24 V		4.5		kΩ
I_{in}	U_{in}=24 V		5.5		mA

Limiting Values

Measured Quantity	Condition/Explanation	Value
U_{RWM} over-voltage protection for inputs	max. 600 W pulse power at a pulse width of 1 ms	30 V

Opto-Isolated Outputs

Conditions: TA = 25 °C

Output drivers	sink	2 x ULN2803
	source	2 x ISO1H811G
External supply	U_{ext}	15…30 V
	U_{Lmax}	U_{ext}
For further specifications see chapter sink driver resp. source driver.		

Sink Driver (UDN2803)

Measured Quantity	Test Criterion	MIN	Type	MAX	Unit
I_{Out}=I_C (output current)	per channel			50	mA
	see also characteristics curves in diagram 15				
I_{CEX} (output leckage current)	U_{CE}=50 V, T_A=25 °C U_{CE}=50 V, T_A=85 °C			50 100	µA
$U_{CE(SAT)}$ (collector emitter saturation voltage)	I_{Out} = 350 mA I_{Out} = 200 mA I_{Out} = 100 mA		1.3 1.1 0.9	1.6 1.3 1.1	V
I_R (clamp diode reverse current)	U_R=50 V, T_A=25 °C U_R=50 V, T_A=85 °C			50 100	µA
U_F (clamp diode forward voltage)	I_F=350 mA			2.0	V
t_{on} (switch-on time)	R_L=125 Ω, U_{out}=50 V C_L=15 pF		0.1	1	µs

t_{off} (switch-off time)	R_L=125 Ω, U_{out}=50 V C_L=15 pF		0.2	1	µs

Output current

The maximum current per output (I_C) depends of the saturation voltage U_{CE} and is limited by the power dissipation of the sum of the channels to

P_{tot} = 1 W per chip:

$P_{tot} = P_0 + \ldots + P_7 \leq 1$ W (at 70 °C)

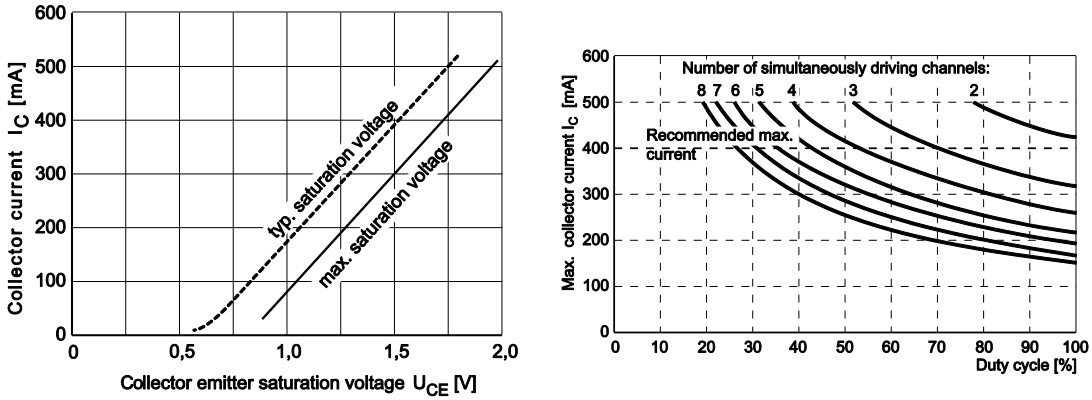

Diagram 15: Characteristic curves UDN2803

Source Driver (ISOH811G)

(short-circuit proof with current limiting and temperature monitoring)

Voltage Supply:

Conditions: U_{ext} = 15…30 V, T_J=-25…+125 °C

Measured Quantity	**Test Criterion**	**MIN**	**Type**	**MAX**	**Unit**
U_{Out}	U_{ext}=24 V; 1 channel with I_{out} = 0.625 A		23.8		V
	see Diagram 15				
I_{Out} /channel	1 channel			625	mA
	16 channels			500	mA
U_{USD} (under-voltage shutdown)		7		10.5	V
R_{ON} (resistance if output active)	I_{out}=0.5 A, T_J=25 °C		150 270	200 320	mΩ mΩ

	I_{out}=0.5 A,T_J=125 °C				
I_S (current consumption driver ship)	8 channels active per chip; without load		10	14	mA
$I_{L(off)}$ (output in inactive state)	U_{in} = U_{out} = 0 V	0	5	30	µA

Switching Times

Measured Quantity	Test Criterion	MIN	Type	MAX	Unit
t_{on} (switch-on time)	R_L= 47 Ω, up to 90 % U_{out}		64	120	µs
t_{off} (switch-off time)	R_L= 47 Ω, up to 10 % U_{out}		89	120	µs
$dU_{out}/dt_{(on)}$ (slope on switch-on)	R_L= 47 Ω, at 0..30 % U_{out} U_{ext} = 15 V		1	2	V/µs
$dU_{out}/dt_{(off)}$ (slope on switch-off)	R_L= 47 Ω, at 70..40 % U_{out} U_{ext} = 15 V		1	2	V/µs

Limiting Values

Measured Quantity	Test Criterion	MIN	Type	MAX	Unit
T_{CSD} (housing switch-off temperature)		125	130	135	°C
T_{CR} (housing reset temperature)		110			°C
T_{TSD} (junction switch-off temperature)		150	175	200	°C
T_R (junction reset temperature)		135			°C
I_{lim} (DC short-circuit current)	U_{ext}=24 V, R_L=10 mΩ		1.1		A

Frequency Input/Output

Availability	alternative subdevice configuration via ME-iDC
Signal form	rectangular

Frequency Measuring Channels

Measured Quantity/ Criterion	**Condition/Explanation**	**Value**
Reference ground	isolated from PC ground	GND_DI
Number of channels	(FI_0...7)	8 inputs (opto-isolated)
Input I		see digital I/O
Input current		see digital I/O
Period (T)	$T_{min.} = T_{min.asym.} = T_{min.sym.}$ $T_{max.asym}$ $T_{max.sym}$	3.3 µs (300 kHz) 16.25 s (0.06 Hz) 32.5 s (0.03 Hz)
Duty cycle	variable, depending on T	measurable in steps of 1 tick
Resolution	1 tick	$15.\overline{15}$ ns
Accuracy		± 15.15 ns
Operating modes		„single“

Pulse Generator Channels

Measured Quantity/ Criterion	**Condition/Explanation**	**Value**
Reference ground	isolated from PC ground	GND_DO
Number of channels	(FO_0...7)	8 outputs (opto-isolated)
Output level	sink or source driver	see digital I/O
Period (T)	$T_{min.} = T_{min.asym.} = T_{min.sym.}$ $T_{max.asym}$ $T_{max.sym}$	0.3 ms (3 kHz) 16,25 s (0,06 Hz) 32,5 s (0,03 Hz)
Duty cycle	variable, depending on T	to be set in steps of 1 tick
Resolution	1 tick	$15.\overline{15}$ ns
Accuracy		$\pm 15.\overline{15}$ ns
Operating modes		Single

Interrupt

Measured Quantity/ criterion	Condition/Explanation	Value
Interrupt sources	passed directly to the PC	bit-pattern change bit-pattern compare

General Data

Measured Quantity/ Criterion	Condition/Explanation	Value
Power supply	via base board	3.3 V/5 V
Current consumption	additional to base board	0.55…0.95 A (full load)
Fuses (see Diagram 3 page 14)	F2 (SMD-Fuse)	5 AT, Type: Littelfuse 419 SM
	F3 (SMD-Fuse)	5 AT, Type: Littelfuse 419 SM
Board dimensions (without slot bracket and connector)	base board requires its own slot	120 mm x 100 mm
Connections	ST1	37-pin D-sub female socket
Operating temperature		0…70 °C
Storage temperature		-40…100 °C
Air humidity		20…55 % (non-condensing)
Certification	CE	

B Pinout

Legend for pinouts:

Pin-name	Function
DI_0...15	digital inputs (subdevice 0)
DO_0...15	digital outputs (subdevice 1)
FI_0..7	frequency measurement inputs (alternative configuration)
FO_0...7	pulse generator outputs (alternative configuration)
VCC_EXT	VCC input for ext. power supply of isolated inputs and outputs, U_{ext} typ. 24 VDC
GND_DI	reference ground for isolated inputs (isolated from outputs and PC ground)
GND_DO	reference ground for isolated outputs (isolated from inputs and PC ground)

Note: In the configuration „pulse generator“ (FO) do not forget to take care of the unused pins DO_8..15. When used as sink drivers they are in high-impedance state, when used as source drivers they are connected to ground!

B1 37-pin D-Sub (ST1)

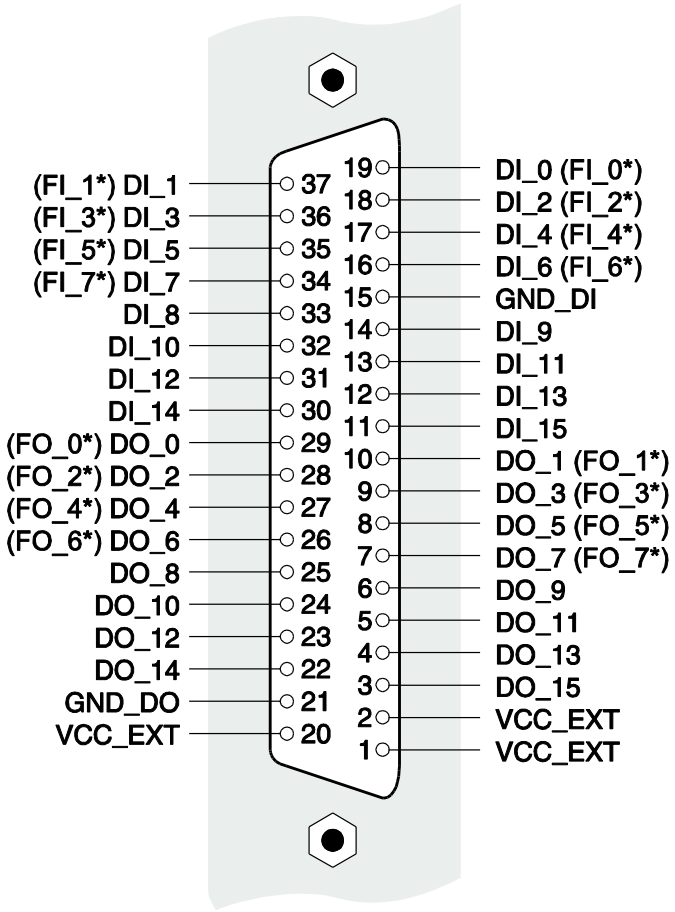

Diagram 16: 37-pin D-Sub female connector of the ME-5004 (ST1)

These pins can only be used as frequency measurement inputs (FI_*x) resp. pulse generator outputs (FO_*x*) after appropriate configuration of the corresponding subdevice with the ME-iDC. The remaining pins of the digital ports cannot be used for digital I/O.

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:

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D-82239 Alling

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Fax:	(08141) 52 71 – 129	Fax:	(08141) 52 71 – 169
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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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