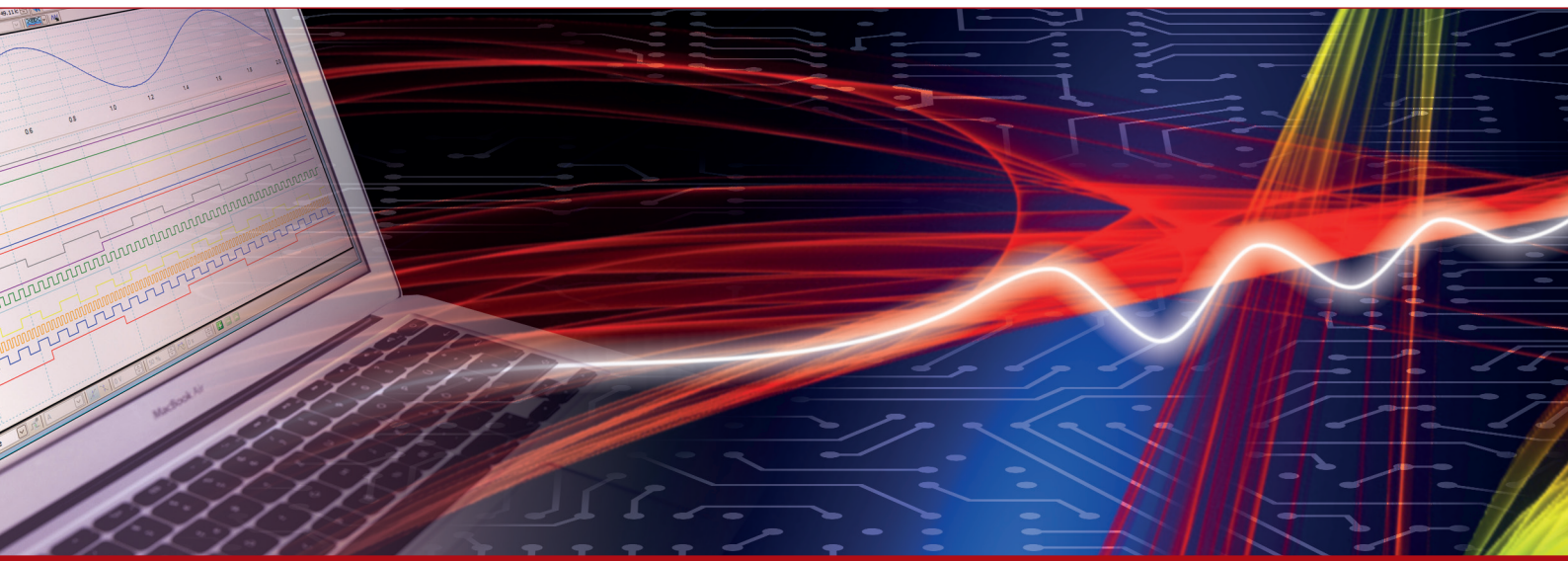# Product Datasheet - Technical Specifications

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ME-5004 Opto-I/O Add-on Board for ME-5000 series

- Additional channel for ME-5000 cobalt series, saves PC ressources:

  16 inputs, 16 outputs, opto-isolated up to 1 kV; input range: 3...60 V variable, output range: 15...30 V variable.

- Source/sink/high-impedance: Sink 50 mA/channel, source 180...370 mA/channel. Source short circuit proof.

- Temperature monitoring cold->hot/hot->cold.

- Frequency output: 8 of the outputs, 3 kHz each.

- Frequency measurement: 8 of the inputs, 300 kHz.

- Bit change: All inputs interrupt capable + bit pattern comparator.

- Connectors: 37-pin D-sub female.

- Firmware configuration and variable channels.

- Uses one slot space, doesn't use the bus connector. Saves PC ressources!

- For use with ME-5100, ME-5810A, ME-5810A/S.

  Cannot be used with ME-5810B, ME-5810B/S, ME-5261, ME-5265, ME-5284.

Model	Opto in	Opto out	Opto counter	Standard firmware functions	Bus platform
ME-5004 PCIe	16	16	3	Single digital-I/O, Frequency measurement (8 of the 16 inputs; 300 kHz each), frequency output (8 of the 16 outputs; 3 kHz each), bit pattern compare with interrupt, bit-change with interrupt	PCI-Express*
ME-5004 cPCI	16	16	3		3 HE CompactPCI/PXI*

* Included Add-on board, ME-Power-DVD with software and PDF user manual, 25-pin mating connector.

Specification

(Ambient temperature 25 ºC)

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:
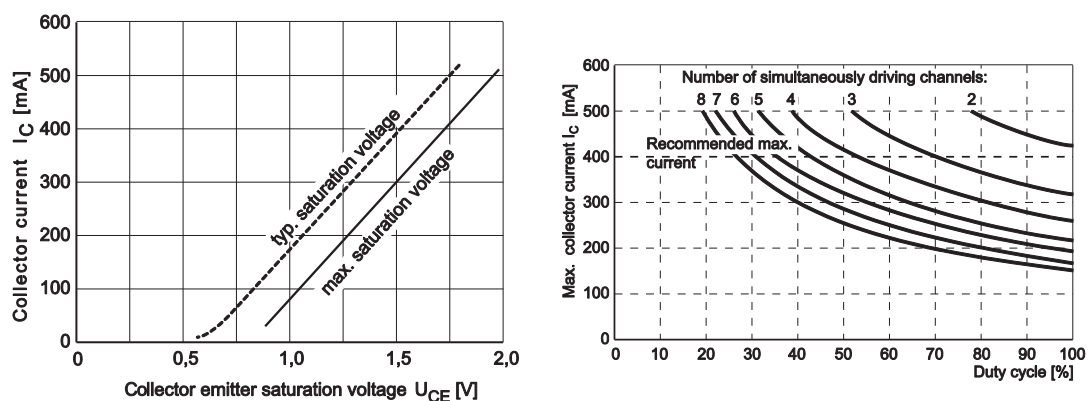
P$_{tot}$ = P$_0$+…+P$_7$≤ 1 W (at 70 ºC)

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 ºC

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 ºC		150 270	200 320	mΩ mΩ

	$I_{out}=0.5\,A, T_J=125\,^oC$				
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)	$R_L= 47\,\Omega$, up to 90 % U_{out}		64	120	µs
t_{off} (switch-off time)	$R_L= 47\,\Omega$, up to 10 % U_{out}		89	120	µs
$dU_{out}/dt_{(on)}$ (slope on switch-on)	$R_L= 47\,\Omega$, at 0..30 % U_{out} $U_{ext} = 15\,V$		1	2	V/µs
$dU_{out}/dt_{(off)}$ (slope on switch-off)	$R_L= 47\,\Omega$, 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	ºC
T_{CR} (housing reset temperature)		110			ºC
T_{TSD} (junction switch-off temperature)		150	175	200	ºC
T_R (junction reset temperature)		135			ºC
I_{lim} (DC short-circuit current)	$U_{ext}=24\,V$, $R_L=10\,m\Omega$		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 l		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		$\pm 15.\overline{15}$ 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 ºC
Storage temperature		-40...100 ºC
Air humidity		20...55 % (non-condensing)
Certification	CE	

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!
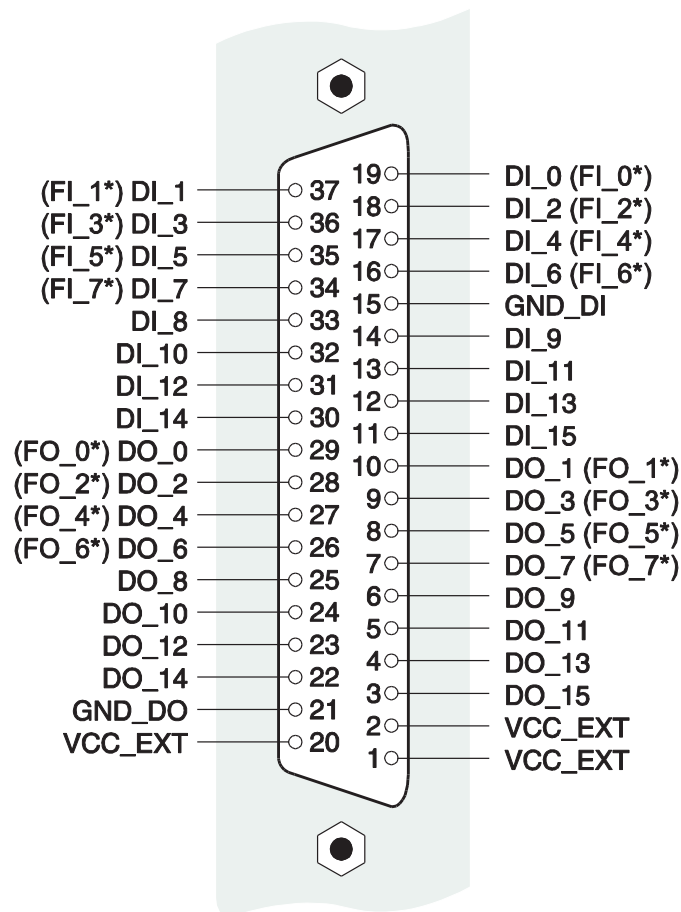
37-pin D-Sub (ST1)

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.