

Product Datasheet - Technical Specifications



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ME-5100 - Digital-I/O Board with Flexible Functions

- PC plug-in board for digital data acquisition and control.
- Base board ME-5100:
 - * Two 16 bit ports (32 TTL digital-I/O channels) with interrupt control and data streaming.
 - * I/O rates up to 30 MHz per 16 bit port depending on operating mode.
 - * Thanks to the DMA busmaster architecture, the ME-5100 can transmit 32 bit wide data directly into the PC's memory at a bandwidth of up to 25 MHz or load them from the memory.
 - * Channels can have variable functions, for example single digital-I/O, streaming digital-I/O, frequency measurement (4 of the channels, 5 MHz each), frequency output (4 of the channels, 5 MHz each).
 - * All inputs can generate an interrupt (bit-change).
- Versions A and B are base boards ME-5100 plus an add-on card ME-5001 or ME-5004.
- Version ME-5100A: Additional 48 TTL digital-I/O channels with add-on card ME-5001.
- Version ME-5100B: Additional 16 opto-isolated inputs and 16 opto-isolated outputs as well as 3 opto-isolated 16 bit counters with add-on card ME-5004.

	ME-5100	ME-5100A (ME-5100 + ME-5001)	ME-5100B (ME-5100 + ME-5004)
TTL Digital-I/O on Base Board (all versions)			
Number	32 I/O channels (2x 16 bit ports)		
Level	TTL, selectable 3.3 V/5 V, active termination		
Operating modes	Single digital-I/O (per port configurable as inputs/outputs). Streaming digital-I/O (16 inputs/ 16 outputs; cPCI 25 MHz, PCIe 30 MHz). Bit-change. Frequency counter (4 of the channels, 5 MHz), impulse generator (4 of the channels, 5 MHz). Trigger: Rising/falling edge, start/stop software, bit-change, Trig_A, Trig_B		
Streaming	yes		
Connector	78-pin D-sub female		
Digital-I/O on Add-on Card (ME-5100A and ME-5100B only)			
Number	-	48 I/O (6 ports, 8 bit each)	16 inputs, 16 outputs
Level	-	TTL; 4 of the 6 ports selectable 3.3/5 V, active termination	Opto-isolated up to 1 kV; input range: 3..60 V variable, output range: 15..30 V variable
Source/sink	-	-	Per port selectable via software, sink 50 mA/channel, source 180..370 mA/channel, source short circuit proof
Operating modes	-	Single digital-I/O (per port configurable as inputs/outputs). Bitchange (interrupt). frequency counter (8 of the channels, 5 MHz each), impulse generator (8 of the channels, 5 MHz each)	Single digital-I/O. Compare (bit pattern compare, interrupt). Bit change (interrupt). Frequency counter (8 of the channels, 300 kHz each), impulse generator (8 of the channels, 3 kHz each)
Streaming	-	-	-
Counters	-	-	3, 16 bit (8354 compatible), opto-isolated
Connector	-	25-pin D-sub female, 2x 20-pin field on-board (recommended: 2x ME AK-D25F/S)	37-pin D-sub female
Bus platform	PCI-Express oder 3 HE CompactPCI/PXI		
Bus platform	1	2 to 4 (slots 2, 3, 4 mounting-slots only, don't use any PC resources/bus connectors)	2 (slot 2 mounting-slots only, doesn't use any PC resources/bus connectors)
Size (mm)	Base board: PCI-Express (111 mm x 168 mm), 3 U CompactPCI/PXI (160 mm x 100 mm)		

Specification

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

Measured Quantity/criterion	Condition/Explanation	Value
Ports	subdevice 0 single mode operation	16-bit-bidirectional
	subdevice 0 streaming mode operation	16-bit input port
	subdevice 1 mode operation	16-bit bidirectional
	subdevice 1 streaming mode operation	16-bit output port
Operating modes	single	software-triggered reading/writing
	stream timer	timer-controlled reading/writing of the values via FIFO
	stream trigger sample	trigger-controlled reading/writing of the values via FIFO
	interrupt	monitoring the digital ports for a change in the bit-pattern
FIFO size	FIFO_IN	8192 values (16-bit-wide)
	FIFO_OUT	8192 values (16-bit-wide)
Transfer rate in streaming mode	between the ME-5100 and PC	max. 25 MHz (cPCI) resp. 30 MHz (PCIe) (system-dependent)

Input/output rate in streaming mode	continuous (total for both ports)	max. 25 MS/s (cPCI) resp. 30 MS/s (PCIe) (system-dependent)
	„burst“-option (input/output of up to 8192 values)	max. 33 MS/s per channel, transfer: see transfer rate
	„wraparound“-option (total for both ports)... if $f_{max.} < 7.4$ MS/s and the number of values ≤ 8192 and the number of repetitions is „infinite“	max. 25 MS/s (cPCI) resp. 30 MS/s (PCIe) (system-dependent)
		max. 7.4 MS/s (without loading the host PC)
Timer (CHAN time)*	programmable in steps 15. 15 ns (1 tick)	30.30 ns ... 65 s (2..FFFFFF Hex ticks)
External trigger inputs		TRIG_A, TRIG_B, DIO_Ax, DIO_Bx
External trigger edges		rising, falling, any
Output level: U_{OL}	at $I_{OUT} = 24$ mA	max. 0.5 V
$U_{OH 3.3V}$	at $I_{OUT} = -24$ mA	min. 2.4 V
$U_{OH 5V}$	at $I_{OUT} = -24$ mA	min. 2.4 V
Input level: U_{IL}	at $V_{CC} = 3.3$ V or 5 V	max. 0.8 V
$U_{IH 3.3V}$	at $V_{CC} = 3.3$ V	min. 2 V
$U_{IH 5V}$	at $V_{CC} = 5$ V	min. 2 V
Input current:	I_{IN}	± 1 μ A
Output current: I_{OUT}	per pin	max. 24 mA
Reference ground		PC ground (GND_PC)
<p>*Due to the nature of the system, boards that are not fitted into the ME Synapse do not reach the full sampling rate. The sampling rate that can actually be achieved depends heavily on the capacity of your computer and on the number of USB devices connected.</p>		

Frequency Input/Output

Availability	alternative subdevice configuration via ME-iDC
Signal form	rectangular

Frequency Measuring Channels

Measured Quantity/Criterion	Condition/Explanation	Value
Reference ground		PC ground (GND_PC)
Number of channels	(FI_A0...3)	4 inputs (TTL)
Input level		see digital I/O
Input current		see digital I/O
Period (T)	$T_{min.} = T_{min.asym.} = T_{min.sym.}$ $T_{max.asym}$ $T_{max.sym}$	181.81 ns (5.5 MHz) 32.5 s (0.03 Hz) 65 s (0.015 Hz)
Duty cycle	variable, depending on T	measurable in steps of 1 tick
Resolution	1 tick	15.15 ns
Accuracy		± 15.15 ns
Operating modes		Single

Pulse Generator Channels

Measured Quantity/Criterion	Condition/Explanation	Value
Reference ground		PC ground (GND_PC)
Number of channels	(FI_BO...3)	4 outputs (TTL)
Output level		see digital I/O
Period (T)	$T_{min.} = T_{min.asym.} = T_{min.sym.}$ $T_{max.asym}$ $T_{max.sym}$	181.81 ns (5.5 MHz) 32.5 s (0.03 Hz) 65 s (0.015 Hz)
Duty cycle	variable, depending on T	adjustable in steps 1 tick
Resolution	1 tick	15.15 ns
Accuracy		± 15.15 ns
Operating modes		single

Interrupt

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

General Data

Measured Quantity/Criterion	Condition/Explanation	Value
Power supply	CompactPCI	+5 V (via PCI bus)
	PCI-Express	+3.3 V (via PCIe bus) +5 V (via Molex plug from PC power supply unit)
Current consumption	CompactPCI	0.8... 1.2 A (full load)
	PCI-Express	0.8... 1.2 A (full load)
Board dimensions (without mounting bracket and connector)	PCI-Express	162 mm x 98 mm
	CompactPCI	3 HE CompactPCI board
Connections	ST1	78-pin D-Sub female socket
		IDC connectors for plug-on board
Operating temperature		0... 70 °C
Storage temperature		-40... 100 °C
Air humidity		20... 55 % (non-condensing)
Certification	CE	

Pinout

Legend for pinouts:

Pin-name	Function
DI_A0..15	digital input/output (subdevice 0)
DO_B0..15	digital input/output (subdevice 1)
TRIG_A	digital trigger input for subdevice 0
TRIG_B	digital trigger input for subdevice 1
DATA_VALID	output indicating the validity of the data at outputs DIO_B0...15 in streaming mode
L_CLK	local clock output (66 MHz). Not connected by default – if necessary, can be brought to the connector (ST1) by fitting R55 (see page 16 for position of R55).
FI_A0...3	frequency measuring inputs (alternative configuration)
FO_B0...3	pulse generator outputs (alternative configuration)
GND_PC	common ground (=PC ground)
„Reserved“	pin reserved for extensions

These pins must not be connected. Otherwise the board may be irreversibly damaged!

78-pin D-Sub (ST1) – ME-5100

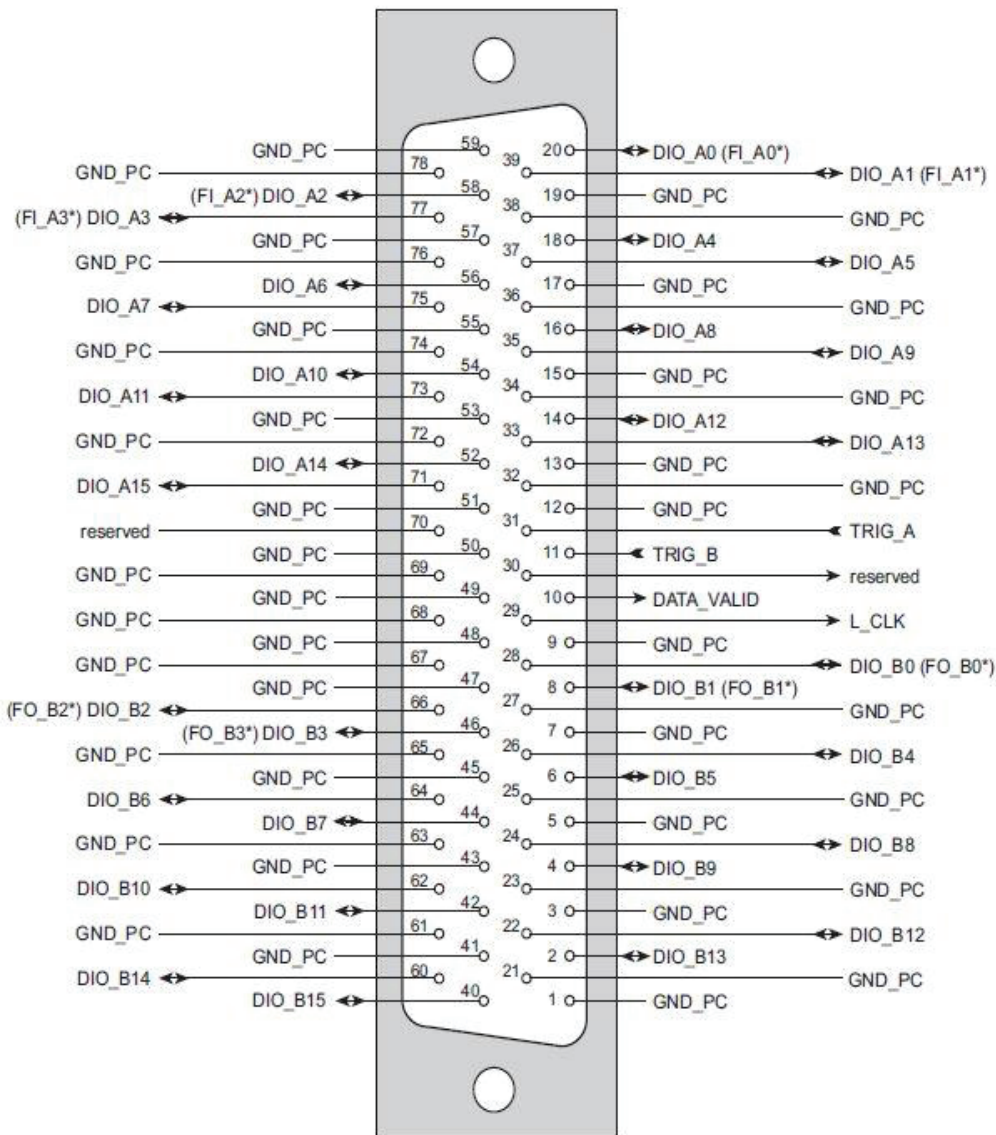


Diagram 15: 78-pin D-Sub socket ME-5100 (ST1)

*Use as a frequency measuring input or pulse generator. Output is only possible after appropriate configuration using ME-iDC. The other pins of the relevant digital port (DIO_A4... 15 or DIO_B4... 15) can then no longer be used for digital input/output.

Note that the unused pins DIO_B4... 15 are connected to ground for frequency output (FO)!

Adapter Board – ME AB-D78/IDC

The optional ME AB-D78/IDC adapter board (78-pin D-Sub connector to male connector) carries a ground line between every signal line. Used together with ribbon cables, you can thus minimize the crosstalk.

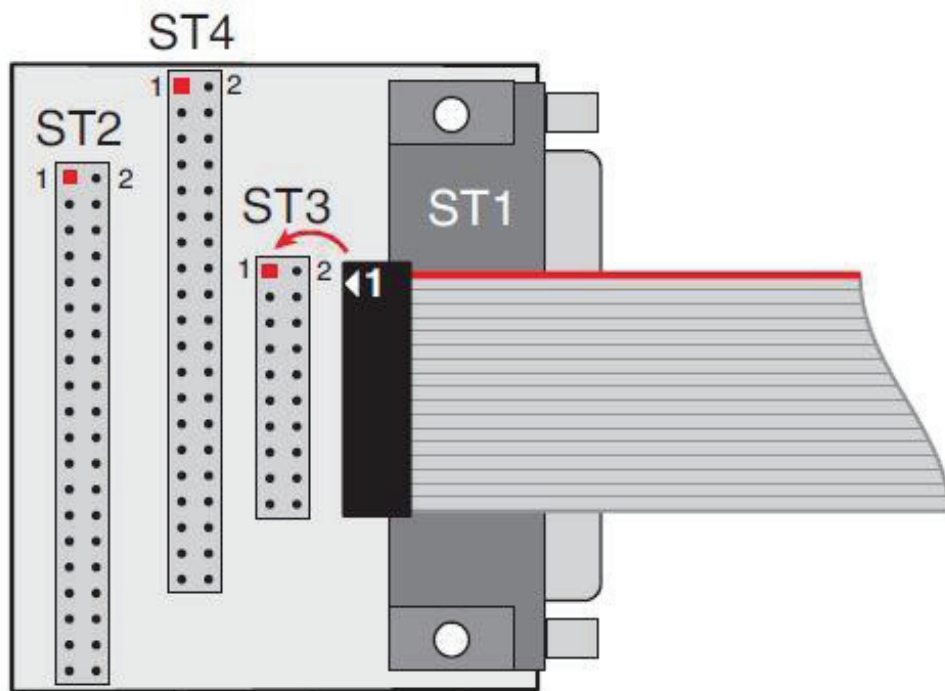


Diagram 16: Adapter board – ME AB-D78/IDC (plan view)

The pin assignment of the 78-pin D-Sub connector ST1 corresponds to ST1 on the ME-5100 (see Diagram 15).

Additional signals (ST3):

ST3 Pin	Name (ST1 pin)	ST3 Pin	Name (ST1 pin)
1	TRIG_A (31)	2	GND_PC
3	TRIG_B (11)	4	GND_PC
5	reserved (30)	6	GND_PC
7	DATA_VALID (10)	8	GND_PC
9	L_CLK (29)	10	GND_PC
11	reserved (70)	12	GND_PC
13	GND_PC	14	GND_PC
15	GND_PC	16	GND_PC

17	GND_PC	18	GND_PC
19	GND_PC	20	GND_PC

Table 6: Control line pin assignments (ST3)

Subdevice 0 (ST4)

ST4 Pin	Name (ST1 pin)	ST4 Pin	Name (ST1 pin)
1	DIO_A0/FI_A0 (20)	2	GND_PC
3	DIO_A1/FI_A1 (39)	4	GND_PC
5	DIO_A2/FI_A2 (58)	6	GND_PC
7	DIO_A3/FI_A3 (77)	8	GND_PC
9	DIO_A4 (18)	10	GND_PC
11	DIO_A5 (37)	12	GND_PC
13	DIO_A6 (56)	14	GND_PC
15	DIO_A7 (75)	16	GND_PC
17	DIO_A8 (16)	18	GND_PC
19	DIO_A9 (35)	20	GND_PC
21	DIO_A10 (54)	22	GND_PC
23	DIO_A11 (73)	24	GND_PC
25	DIO_A12 (14)	26	GND_PC
27	DIO_A13 (33)	28	GND_PC
29	DIO_A14 (52)	30	GND_PC
31	DIO_A15 (71)	32	GND_PC
33	GND_PC	34	GND_PC
35	GND_PC	36	GND_PC
37	GND_PC	38	GND_PC
39	GND_PC	40	GND_PC

Table 7: ST4 pin assignments

Subdevice 1 (ST2)

ST2 Pin	Name (ST1 pin)	ST2 Pin	Name (ST1 pin)
1	DIO_B0/(FO_B0)	2	GND_PC
3	DIO_B1/(FO_B1)	4	GND_PC
5	DIO_B2/(FO_B2))	6	GND_PC
7	DIO_B3/(FO_B3))	8	GND_PC

9	DIO_B4	10	GND_PC
11	DIO_B5	12	GND_PC
13	DIO_B6	14	GND_PC
15	DIO_B7	16	GND_PC
17	DIO_B8	18	GND_PC
19	DIO_B9	20	GND_PC
21	DIO_B10	22	GND_PC
23	DIO_B11	24	GND_PC
25	DIO_B12	26	GND_PC
27	DIO_B13	28	GND_PC
29	DIO_B14	30	GND_PC
31	DIO_B15	32	GND_PC
33	GND_PC	34	GND_PC
35	GND_PC	36	GND_PC
37	GND_PC	38	GND_PC
39	GND_PC	40	GND_PC

Table 8: ST2 pin assignments