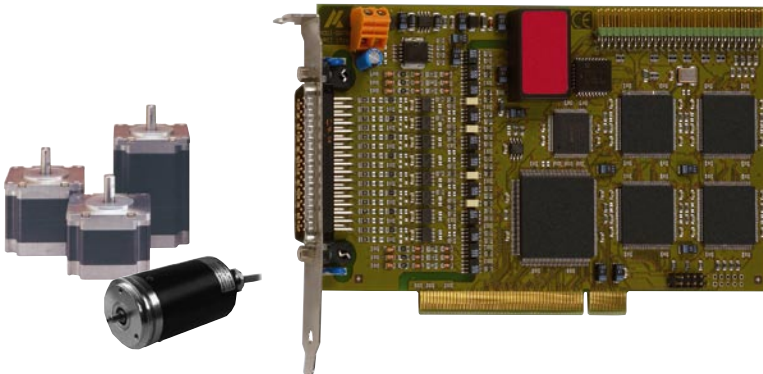


# Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM, ...



PCI 32-bit

Also for **CompactPCI™**  
See CPCI-1710, page 180

Also for  
**PCI EXPRESS®**  
see APCL-1711  
page 86



Signed 64-bit drivers for  
Windows 7/Vista/XP



\* for SSI, incremental counter, digital I/O

The board APCI-1710 is a fast multifunction and multi-channel counter board for the PCI bus. The strengths of this board are its wide range of applications and high precision and reliability for rough industrial applications. With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which provides the user with maximum efficiency yet minimum space and parts requirement. The functions are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed and reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

## Features

- 32-bit data access
- Up to 5 MHz input frequency
- Signals in TTL or RS422 mode (APCI-1710), 24 V signals (APCI-1710-24V)
- Four onboard function modules
- Reprogrammable functions

## Functions

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- SSI synchronous serial interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- BiSS-Master
- Digital inputs and outputs
- Edge time measurement (ETM)
- Customised functions

## Available channels for all four function modules

- 20 channels for digital inputs, optically isolated
- 8 channels, programmable either as digital inputs or outputs, optically isolated
- 4 digital power outputs, optically isolated

## APCI-1710

### Available functions:

incremental counter, SSI synchronous serial interface, counter/timer, pulse acquisition, frequency/pulse width/period duration/velocity measurement, PWM, BiSS-Master, digital inputs and outputs, ...

### Function selection through software

### Optical isolation

TTL, RS422, 24 V

### Available lines for each function module

8 lines are available for each function module

- Input lines:
  - 2 x TTL and RS422 (APCI-1710) or 2 x 24 V (APCI-1710-24V)
  - 3 x 24 V, optional 5 V for channels E, F, G
- Output lines:
  - 1 x 24 V, optional 5 V (power output)
- 2 channels, programmable either as digital inputs or outputs, optically isolated: 2 x TTL, RS422

### Safety features

- Creeping distance IEC 61010-1
- Optical isolation 1000 V
- Noise neutralisation of the PC supply

## Applications

- Event counting • Position acquisition
- Motion control • Batch counting
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers f. Windows 7/Vista/XP
- RTX drivers (real-time)

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

The software functions can be adapted to your applications on request. The board can also be implemented for other software applications.

**Wide range of applications through free combination of function modules**

4 function modules quickly and easily programmable with numerous functions

Each of the four modules is programmed with one function. You can program 4 times the same function or freely combine 4 different functions.

| Configuration example 1        |                                |                   |                   |
|--------------------------------|--------------------------------|-------------------|-------------------|
| Function module 0              | Function module 1              | Function module 2 | Function module 3 |
| 1 x 32-bit Incremental counter | 1 x 32-bit Incremental counter | 4 x Pulse counter | 3 x Counter/Timer |

| Configuration example 2 |                   |                                |                       |
|-------------------------|-------------------|--------------------------------|-----------------------|
| Function module 0       | Function module 1 | Function module 2              | Function module 3     |
| 3 x SSI                 | 3 x SSI           | 1 x 32-bit Incremental counter | 8 x Digital I/O, 24 V |

**Programmable onboard modules**

Each onboard module can be programmed with the function of your choice. You can simultaneously operate up to 4 different functions on one board. If your application must be modified, you can load a new function quickly and easily per mouse click in the SET1710 configuration program which is delivered with the board.

**Overview of signal generators resp. functions**

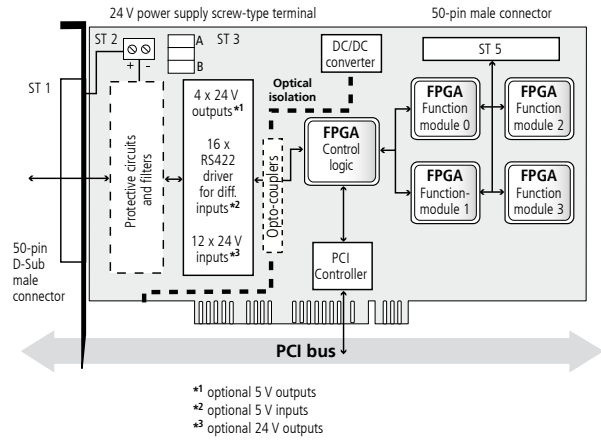
| Application         | Max. number of signal generators or functions for each function module | Max. number of function modules for each APCI-1710 | Max. number of signal generators or functions of each APCI-1710 | Page |
|---------------------|--|--|---|------|
| Incremental counter | 1 (32-bit) or 2 (16-bit)   | 4  | 4 or 8  | 128  |
| SSI*                | 3  | 4  | 12  | 128  |
| Chronos             | 1  | 4  | 4   | 129  |
| BiSS-Master         | 1  | 4  | 4   | 129  |
| Counter/Timer*      | 3  | 4  | 12  | 130  |
| TOR                 | 2  | 4  | 8   | 131  |
| Pulse acquisition   | 4  | 4  | 16  | 132  |
| PWM*                | 2  | 4  | 8   | 132  |
| ETM                 | 2  | 4  | 8   | 133  |
| Digital I/O         | 8  | 4  | 32  | 133  |
| TTL                 | 24   | 1  | 24  | 133  |

\* Funktion not for APCI-1710-24V



**Customer-tailored modifications,** designed to suit your needs. Hardware and software, firmware, PLDs, ... **Contact us!**

**Simplified block diagram**

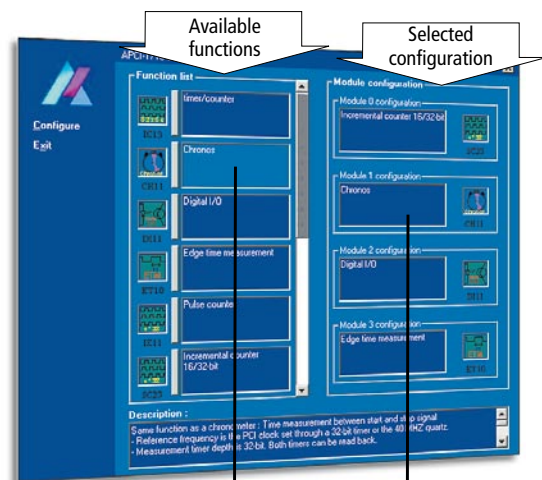


**Pin assignment**

| Pin      | Pin    | Pin      |
|----------|--------|----------|
| 34 +UREF | 18 A2+ | 34 18    |
| 35 HO*   | 19 A2- | 35 2     |
| 36 H1*   | 20 B2+ | 36 3     |
| 37 H2*   | 21 B2- | 37 4     |
| 38 H3*   | 22 C2+ | 38 5     |
| 39 E0*   | 23 C2- | 39 6     |
| 40 E1*   | 24 D2+ | 40 7     |
| 41 E2*   | 25 D2- | 41 8     |
| 42 E3*   | 26 A3+ | 42 9     |
| 43 F0*   | 27 A3- | 43 10    |
| 44 F1*   | 28 B3+ | 44 11    |
| 45 F2*   | 29 B3- | 45 12    |
| 46 F3*   | 30 C3+ | 46 13    |
| 47 G0*   | 31 C3- | 47 14    |
| 48 G1*   | 32 D3+ | 48 15    |
| 49 G2*   | 33 D3- | 49 16    |
| 50 G3*   |        | 50 17    |
|          |        | 1 EXTGND |
|          |        | 2 A0+    |
|          |        | 3 A0-    |
|          |        | 4 B0+    |
|          |        | 5 B0-    |
|          |        | 6 C0+    |
|          |        | 7 C0-    |
|          |        | 8 D0+    |
|          |        | 9 D0-    |
|          |        | 10 A1+   |
|          |        | 11 A1-   |
|          |        | 12 B1+   |
|          |        | 13 B1-   |
|          |        | 14 C1+   |
|          |        | 15 C1-   |
|          |        | 16 D1+   |
|          |        | 17 D1-   |

\*Each number corresponds to the number of the function module

**Program SET1710**



Click the function you want to load. Hold the mouse key pressed ...

... and drag the function to the selected function module

## Function Incremental encoder

Up to 2 incremental encoders can be connected to a module programmed with the function **Incremental encoder**.

- 90° phase-shifted input signals (displacement measurement systems)
- Motion control
- Pulse width and frequency measurement
- Incremental encoder acquisition
- Tolerance measurement
- Velocity measurement
- Rotation measurement
- Electronic “mouse”

### Function range of the counter component

- Simple, double, quadruple analysis of 2 phase-shifted clock pulses (A, B)
- Direction recognition for upwards or downwards counting
- Hysteresis circuit for the absorption of the first pulse after a change in rotation; switchable
- 2 x 32-bit data latches, indiv. programmable for internal / external strobe, latch strobe synchronised with an internal clock pulse
- Operating mode is defined by an internal mode register, loadable and readable through the data bus
- Strobe inputs which can be triggered either through 2 external pins (24 V input) or by writing in a register
- Interrupt indication triggered through the external strobe inputs
- Compare logic, interrupt and reference point logic

### Used signals

| Signal name | Pin name | Signal type                     | Function  |
|-------------|----------|---------------------------------|---|
| A_x         | Ax +/-   | Diff./TTL/24 V*                 | A signal of the incremental encoder (32-bit) resp. A signal of the incremental encoder 0 (16-bit) |
| B_x         | Bx +/-   | Diff./TTL/24 V*                 | B signal of the incremental encoder (32-bit) resp. B signal of the incremental encoder 0 (16-bit) |
| INDEX_x     | Cx +/-   | Diff./TTL/24 V*                 | Index signal of the incremental encoder (32-bit)  |
| C_x         | Cx +/-   | Diff./TTL/24 V*                 | A signal of the incremental encoder 1 (2x16-bit)  |
| UAS_x       | Dx +/-   | Diff./TTL/24 V*                 | Error signal input (32-bit)   |
| D_x         | Dx +/-   | Diff./TTL/24 V*                 | B signal of the incremental encoder 1 (2x16-bit)  |
| REF_x       | Ex       | 24 V / 5 V optional             | Digital input (can also control the reference point logic)  |
| ExtStrb_a_x | Fx       | 24 V / 5 V optional Active High | Digital input (can be used for latch logic, respectively generate an interrupt)                   |
| ExtStrb_b_x | Gx       | 24 V / 5 V optional Active High | Digital input (can be used for latch logic, respectively generate an interrupt)                   |
| DIG_OUT_x   | Hx       | 24 V / optional 5 V             | Digital output  |

x: Number of the function module (See pin assignment page 123)

\* 24 V for the APCI-1710-24 V

## Function Synchronous serial interface (SSI)

The function module is programmed as a synchronous serial interface. The **SSI** function is an interface for systems which allow an absolute position information through serial data transfer.

### Typical application examples:

- Acquisition of displacement measurement systems
- Axis control (X, Y and Z)
- Tolerance measurement ...



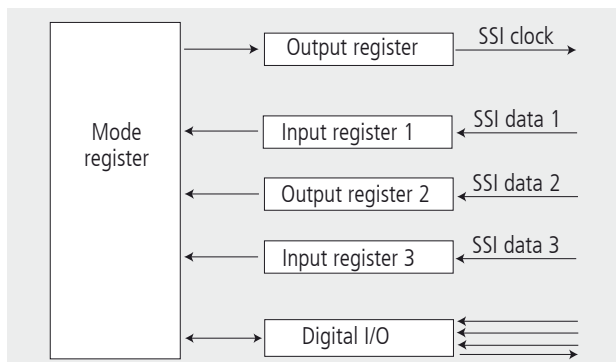
### Properties

- 4 function modules for each board, up to 3 SSI encoders per function module (depends on encoder)
- Complete isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Serial data transfer
- Common clock pulse for the 3 interfaces per function module
- Clock frequency and number of data bits are software-programmable
- GRAY to BINARY conversion possible
- For each function module there are 3 digital inputs and 1 digital output for an additional function (no effect on SSI function)

### The interface includes:

- Three independent 32-bit SHIFT registers, which can be read through the data bus
- Clock and pulse generator
- Function and control logic

### Block diagram SSI



### Used signals

| Signal name | Pin name | Signal type         | Function                                 |
|-------------|----------|---------------------|--|
| Clock_x     | Ax +/-   | RS422               | Clock output signal for the SSI encoders |
| DATA1_x     | Bx +/-   | RS422/TTL           | Data input 1 for the first encoder       |
| DATA2_x     | Cx +/-   | RS422/TTL           | Data input 2 for the second encoder      |
| DATA3_x     | Dx +/-   | RS422/TTL           | Data input 3 for the third encoder       |
| Input1_x    | Ex       | 24 V / 5 V optional | Digital input 1                          |
| Input2_x    | Fx       | 24 V / 5 V optional | Digital input 2                          |
| Input3_x    | Gx       | 24 V / 5 V optional | Digital input 3                          |
| Output_x    | Hx       | 24 V / 5 V optional | Digital output                           |

x: Number of the function module (See pin assignment page 123)

The SSI function cannot be programmed on the APCI-1710-24 V.

## Function Chronos

The function **Chronos** is a timer interface which allows to measure the time between two "events" like a chronometer.

3 functions are available:

- a 32-bit timer to create a time reference,
- a 32-bit measuring timer to determinate and measure the time between start and stop pulse.
- 3 digital inputs and 3 digital outputs

### Properties

- Complete isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Interrupt status at the end of the measuring time
- Timer readable
- Input and output channels can be inverted through software  
Software GATE possible

### Function description

The pulse signals from Timer 0 are counted between the start pulse signal and the stop pulse signal. The number of pulses is then stored in the measuring timer and can be read through I/O read commands. The timer 0 is used as a time reference generator. The divider factor is written in timer 0

and determines the output frequency.

The input frequency is set according to the PCI clock pulse or to the 10 MHz onboard clock generator. Timer 0 is synchronised with the start event or with the 40 MHz quartz of the board.

Timer 0 can be read at any time. The **Chronos** function can be used in 8 different modes.

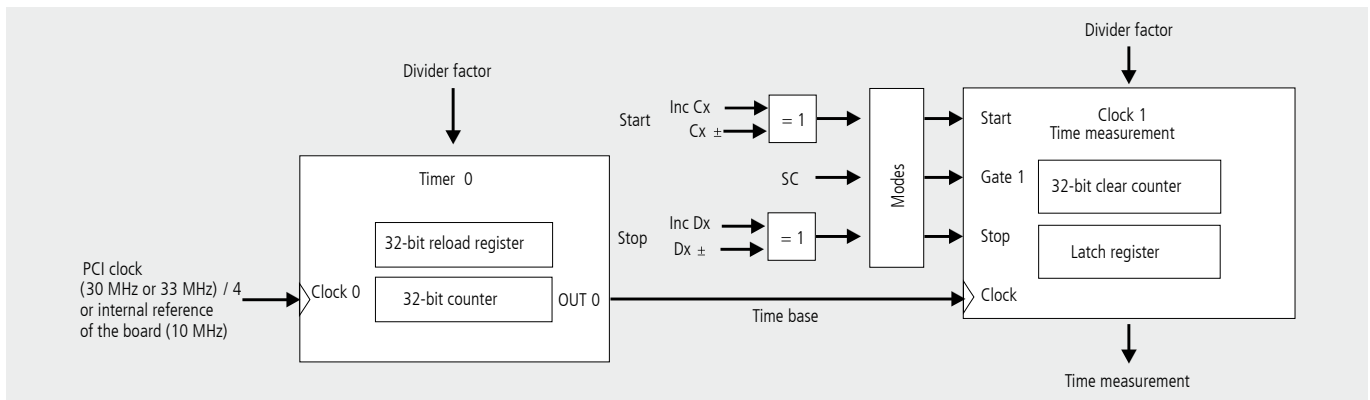
### Used signals

| Pin name | Signal type         | Function                                 |
|----------|---------------------|--|
| Ax +/-   | Diff./TTL, 24 V*    | Digital output 1; set to "0" after reset |
| Bx +/-   | Diff./TTL, 24 V*    | Digital output 2; set to "0" after reset |
| Cx +/-   | Diff./TTL/24 V*     | Start pulse for measuring                |
| Dx +/-   | Diff./TTL/24 V*     | Stop pulse for measuring                 |
| Ex       | 24 V / 5 V optional | Digital input 0, inverting               |
| Fx       | 24 V / 5 V optional | Digital input 1, inverting               |
| Gx       | 24 V / 5 V optional | Digital input 2, inverting               |
| Hx       | 24 V / 5 V optional | Digital output 0; set to "0" after reset |

x: Number of the function module (See pin assignment page 123)

\*24 V for the APCI-1710-24 V

### Block diagram Chronos



## Function BiSS-Master

The function **BiSS-Master** is a bidirectional sensor interface for the communication with positioning encoders. The following types of communications are supported:

### Functions of the BiSS-Master:

- Sensor data transmission
- Register data transmission
- Multicycle data transmission

More information about the function range of the BiSS interface on [www.biss-interface.com](http://www.biss-interface.com).

### Limits and differences with respect to the BiSS specification:

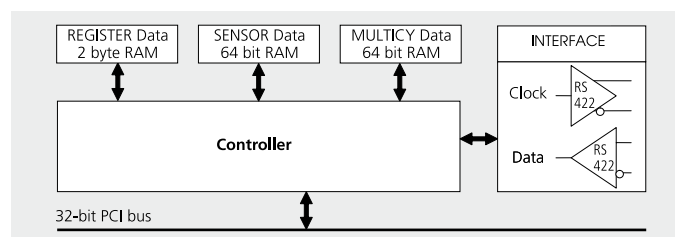
- One channel available, to which a BiSS slave can be connected
- The functionality "automatic sensor data request" is not available
- Data buffer for two sensor registers available
- The board APCI-1710-10K20 is required

### Used signals

| Signal name  | Pin name | Signal type | Function   |
|--------------|----------|-------------|--|
| Input_Ch1_x  | Cx +/-   | Diff.       | Digital input 1 (data line from slave to master)   |
| Output Ch1_x | Ax +/-   | Diff.       | Digital output 1 (clock line from master to slave) |

x: Number of the function module (See pin assignment page 123)

### Block diagram BiSS-Master



## Function Counter/Timer

### Function equivalent to Intel 82C54

The module **Counter/Timer** can be used as a programmable interval counter/timer (similar to Intel 82C54) with 3 x 32-bit per module.

It generates time delays through software control. Instead of setting up timing loops in software, the user programs the module for the desired delays. After this delay, the module will interrupt the PC.

- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits
- 3 x 32-bit counters/timers, binary counting only
- 6 programmable modes
- Status readback and latch command
- Inputs and outputs can be inverted through software
- Hardware and software gate possible, readable
- Simple interface: no multiple assignment of the addresses
- Interrupt enabled with an individual release bit per counter/timer and interrupt status register
- Available clock: PCI clock divided by four (APCI-1710 only) or 10 MHz of the onboard quartz oscillator, selectable through software

#### Typical applications:

- Event counter
- Programmable rate generator
- Binary rate multiplier
- Square-wave generator
- Complex motor controller / signal generator

### Programmable modes

For each counter/timer (3 x 32-bit) there are 6 modes available: mode 0 to mode 5, which can be programmed independently.

#### Mode 0: Interrupt on terminal count

Mode 0 is particularly suitable for event counting. The output is initially set to "Low" and remains "Low" until the counter reaches 0.

The output then goes "High" and holds this state until a new count or a new counter value is written into the counter.

#### Mode 1: Hardware retriggerable one-shot

This mode is identical to mode 0 except for the GATE input. The GATE input is not used to activate or deactivate the timer, but to trigger it.

#### Mode 2: Pulse generator

In this mode the counter is dividing the choosed input clock through the start value "ul\_ReloadValue". Mode 2 is used for generating a real-time clock interrupt.

After initialization the output is set to "High". When the initial count has decremented to 1, the output goes "Low". For only one clock pulse the output is setted on "Low" then it goes back to "High". The counter reloads the start value ("ul\_ReloadValue") and the counter sequence is repeated. The number of sequences is unlimited. An interrupt can be generated at the end of the cycle. Calculation of time:  $(ul\_ReloadValue + 2) \times$  input clock

#### Mode 3: Square wave mode

Mode 3 is used for baud rate generation. It is similar to mode 2 except for the duty cycle of the output. The output is initially set to "High". When half the initial count has expired, the output is set to "Low" for the remainder of the count. Mode 3 is periodic; the same sequence is repeated indefinitely. Calculation of time:  $(ul\_ReloadValue + 2) \times$  input clock

#### Mode 4: Software-triggered strobe

The output is initially set to "High". When the initial count expires, the output goes "Low" for one clock pulse and then goes "High" again. The counting sequence is triggered by writing the initial count. If a new count is written during counting, it will be loaded on the next clock pulse and counting will continue from the new count.

#### Mode 5: Hardware-triggered strobe [retriggerable]

This mode is identical to mode 4 except for the GATE input. The GATE input is not used to activate or deactivate the timer, but to trigger it.

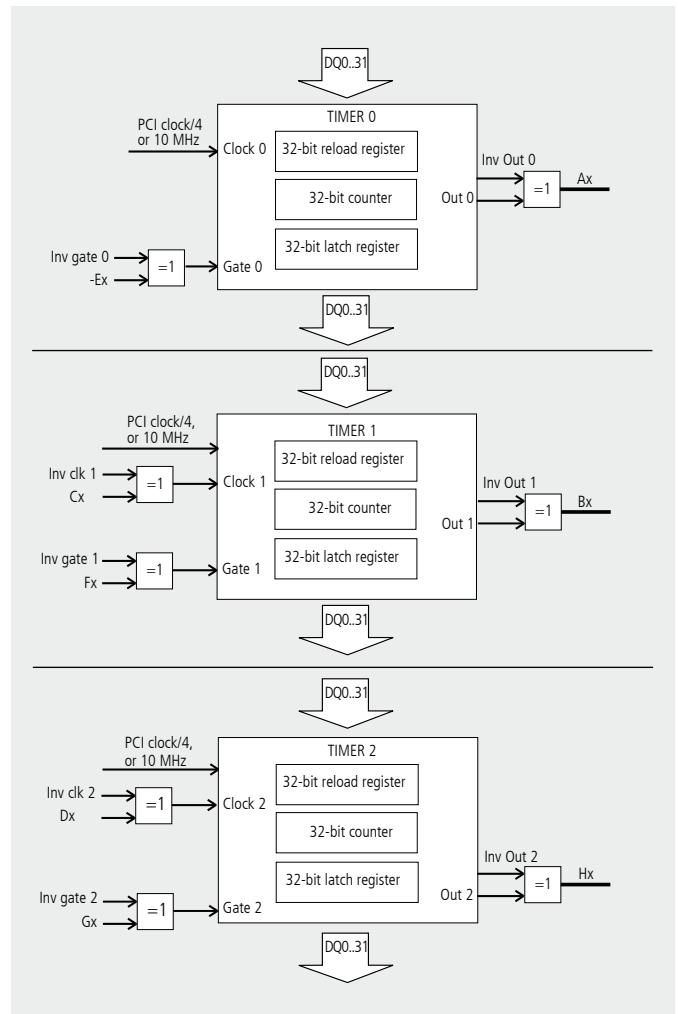
### Used signals

| Signal name | Pin name | Signal type           | Function                               |
|-------------|----------|-----------------------|--|
| OUT1_x      | Ax +/-   | Diff./TTL             | Output of counter/timer 0              |
| OUT2_x      | Bx +/-   | Diff./TTL             | Output of counter/timer 1              |
| OUT3_x      | Hx       | 24 V / 5 V opt.       | Output of counter/timer 2              |
| GATE1_x     | Ex       | 24 V / 5 V opt.       | GATE Input of counter/timer 0          |
| GATE2_x     | Fx       | 24 V / 5 V opt.       | GATE Input of counter/timer 1          |
| GATE3_x     | Gx       | 24 V / 5 V opt.       | GATE Input of counter/timer 2          |
| CLK1_x      | -        | -                     | Internal clock                         |
| CLK2_x      | Cx +/-   | Diff./TTL/ 24 V opt.  | Clock counter input of counter/timer 1 |
| CLK3_x      | Dx +/-   | Diff./ TTL/ 24 V opt. | Clock counter input of counter/timer 2 |

x: Number of the function module (See pin assignment page 123)

The Counter/Timer function cannot be programmed on the APCI-1710-24 V.

### Block diagram Counter/Timer



## Function TOR

The **TOR** function is a counter interface which allows counting input signals in a defined time interval.

2 TOR counters are available on each function module. Each TOR counter includes 2 x 32-bit timers.

The TOR function is a scaled-down version of the Counter/Timer function. The pulse signal of Timer 1 gives the start and stop pulse signal to Timer 0. Timer 0 counts the input signals. After the stop signal from Timer 0 the number of pulses is stored and can be read through I/O read commands. The timer 1 is used as a time reference generator.

The divider factor is written in timer 1 and determines the output frequency. The input frequency is set according to the PCI clock pulse or the 40 MHz on-board quartz clock. Timer 0 is synchronised with the start event.

### Pulse measurement

As soon as a start signal occurs from Timer 1, the Timer 0 is reset.

It counts the pulse signals of the channel Ax(Bx).

During the process the status bit "Counter in Progress" is set.

As soon as a stop signal occurs from Timer 1, the Timer 0 is stopped and the status bit "Counter in Progress" is reset.

An interrupt can also be generated. The value can then be read. The latest measured value is read in the counter measurement register.

### Properties:

- Complete isolation through opto-couplers for the input and output channels to avoid earth circuit
- Interrupt status at the end of the measuring period
- Inputs and output can be inverted through software
- Software GATE

The function **TOR** occupies 4 inputs (A to D) of the corresponding function module of the APCI-1710 or CPCI-1710.

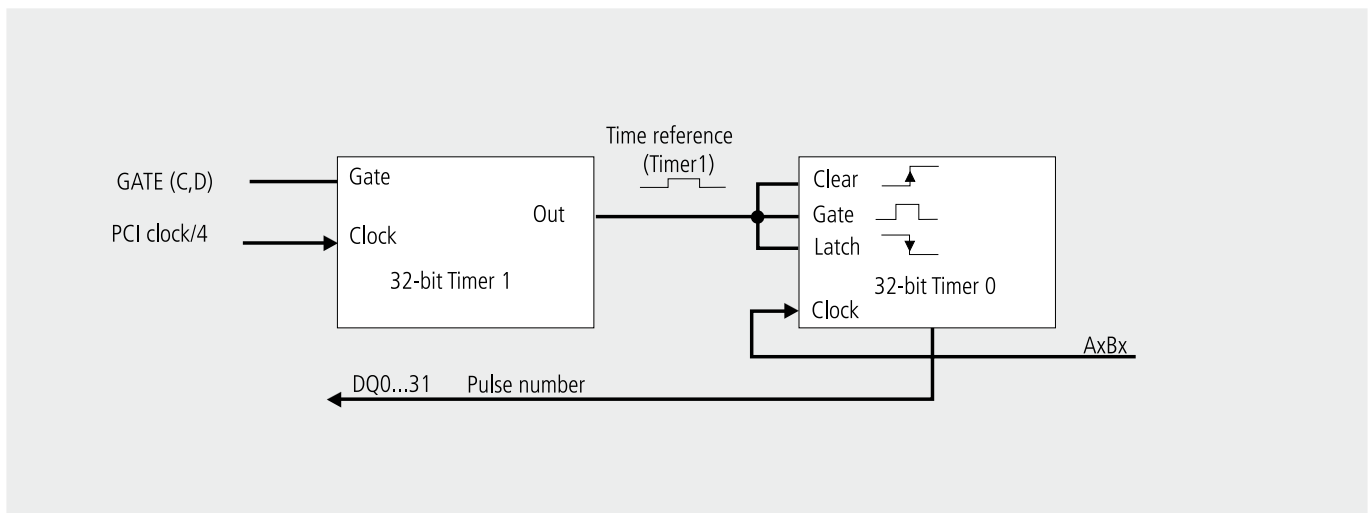
### Used signals

| Pin name | Signal type     | Function               |
|----------|-----------------|------------------------|
| Ax +/-   | Diff./TTL/24 V* | Digital input 1 (TOR1) |
| Bx +/-   | Diff./TTL/24 V* | Digital input 2 (TOR2) |
| Cx +/-   | Diff./TTL/24 V* | External Gate (TOR1)   |
| Dx +/-   | Diff./TTL/24 V* | External Gate (TOR2)   |

x: Number of the function module (see pin assignment page 123)

\*24 V for the APCI-1710-24 V

### Block diagram TOR



## Function Pulse counter

The **Pulse counter** is an interface for the acquisition of external digital pulses. Each rising or falling edge on the counter input starts decrementing from the initially set counter value. An interrupt is generated at logical “0”, i.e. the digital output is set or reset.

- 4 x 32-bit down counters
- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Each counter can be loaded with a predefined counter value
- Interrupt at overflow
- Output can be set or reset at overflow
- Polarity of the inputs selectable through software

The interface includes:

- 4 x 32-bit counters
- 4 independent 32-bit registers, readable through the data bus
- a function and control logic.

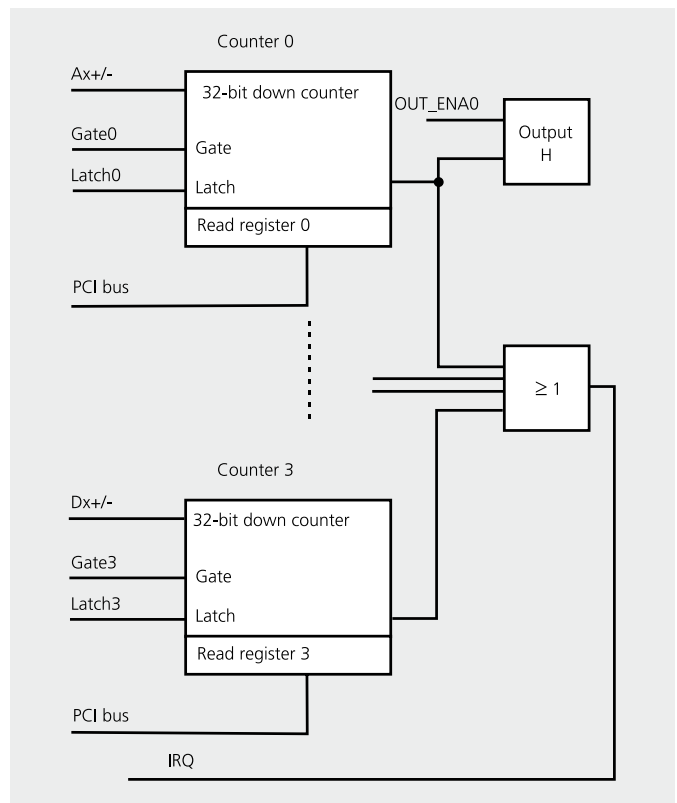
### Used signals

| Pin name | Signal type       | Function                             |
|----------|-------------------|--------------------------------------|
| Ax +/-   | Diff./TTL/24 V*   | Input of the 1st counter             |
| Bx +/-   | Diff./TTL/24 V*   | Input of the 2nd counter             |
| Cx +/-   | Diff./TTL/24 V*   | Input of the 3rd counter             |
| Dx +/-   | Diff./TTL/24 V*   | Input of the 4th counter             |
| H        | 24 V/5 V optional | Common digital output of the counter |

x: Number of the function module (see pin assignment page 123)

\* 24 V for the APCI-1710-24V

### Block diagram Pulse counter



## Function PWM (Pulse width modulation)

The function **PWM** is an interface for pulse width modulation. It generates a frequency and defines the time duration (pulse width) of the “Low” and “High” level. The function generates rectangle signals. The output pulses from the timer generate the pulse width modulation.

### PWM generator

The “Low/High” time-divider factor is written in the timer and determines the output frequency. The input frequency is set according to the PCI clock or the 40 MHz quartz of the board.

The function includes:

- a 32-bit frequency generator for setting the “Low” and “High” levels
- 2 digital inputs as start or stop trigger
- 2 digital frequency outputs

### Properties:

- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits.
- Interrupt status after end of period
- Selection of the start level
- Selection of the stop level
- Hardware gate
- Software gate

### Typical applications

- Frequency generation
- Pulse width modulation
- Drive technology

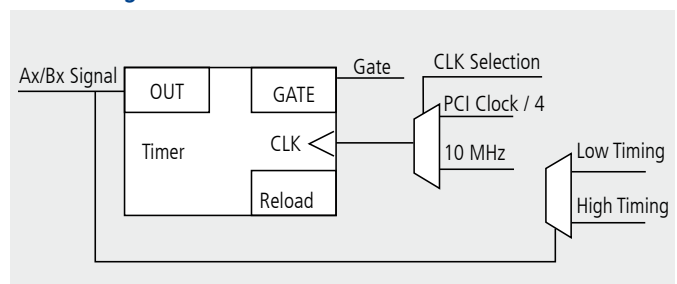
### Used signals

| Signal name   | Pin name | Signal type      | Function                                    |
|---------------|----------|------------------|---|
| PWM_OUT_Ch0_x | Ax +/-   | Diff./TTL output | digital output PWM 0                        |
| PWM_OUT_Ch1_x | Bx +/-   | Diff./TTL output | digital output PWM 1                        |
| GATE_Ch0_x    | Cx +/-   | Diff./TTL input  | Gate input PWM 0                            |
| GATE_Ch1_x    | Dx +/-   | Diff./TTL input  | Gate input PWM 1                            |
| DIG_IN_E_x    | Ex       | 24 V input       | digital input                               |
| DIG_IN_F_x    | Fx       | 24 V input       | digital input                               |
| DIG_IN_G_x    | Gx       | 24 V input       | digital input                               |
| DIG_IN_E_x    | Ex       | 24 V input       | digital output PWM 0 or freely controllable |

x: Number of the function module (See pin assignment page 123)

The PWM function cannot be programmed on the APCI-1710-24 V.

### Block diagram PWM



## Function ETM (Edge Time Measurement)

The **ETM** function is a timer interface, which allows to measure simultaneously the time of a period and the time of the “High” or “Low” levels of this period. 2 functions are implemented:

- 1 x 32-bit timer which is set as the reference time
- 2 x 32-bit measuring timers which measure the time of the period and of the “High” or “Low” levels

### Properties:

Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits

- Interrupt can be generated at the end of the measurement
- Timer can be read back
- Inputs and outputs can be inverted through software
- Software gate

The interface includes:

- 1 gate input
- 2 independent 32-bit timers which can be written or read back through the data bus.

### Typical applications

- Period duration measurement
- Level duration measurement

### Used signals

The ETM function requires 4 inputs (A to D) on each function module of the APCI-1710 or CPCI-1710 (see page 130).

Up to 8 ETM (2 per module) can be used on one board.

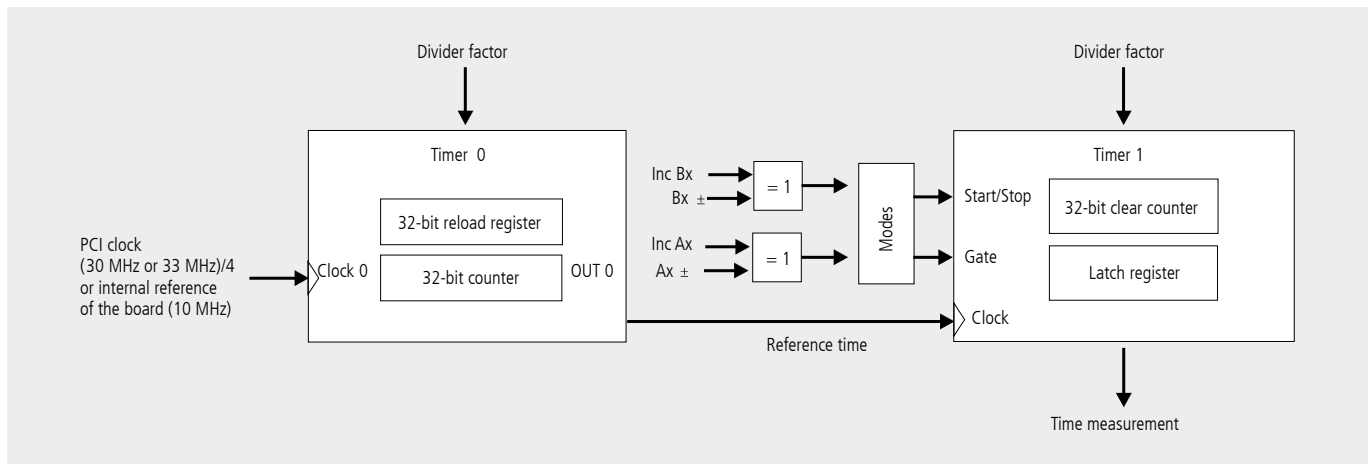
### Used signals

| Pin name | Signal type     | Function                        |
|----------|-----------------|---------------------------------|
| Ax +/-   | Diff./TTL/24 V* | Gate input of the ETM counter 0 |
| Bx +/-   | Diff./TTL/24 V* | Input of the ETM counter 0      |
| Cx +/-   | Diff./TTL/24 V* | Gate of the ETM counter 1       |
| Dx +/-   | Diff./TTL/24 V* | Input of the ETM counter 1      |

x: Number of the function module (see pin assignment page 123)

\*24 V for the APCI-1710-24V

## Block diagram ETM



## Function Digital input and output

The **Digital input and output** function allows an easy access to the digital I/O available on the function modules. The I/O level of the input and output channels are read and set or reset through read/write commands. The digital I/O have no logical connection to each other. The connection can only be made through software. The complete isolation through opto-couplers avoids earth circuits.

### Available channels

- 3 x 24 V mass-related input channels, optional 5 V
- 2 x differential input channels (RS422/485), can also be used as TTL input channels
- 1 digital output, 24 V, load to ground (10 to 36 V / 500mA)
- 2 differential inputs or outputs (RS485), can also be used as TTL input or output channels. Software configuration.

When the digital I/O function is programmed on all function modules, up to 28 digital input and 12 digital output channels are available

### Used signals

| Pin name | Signal type         | Function                                      |
|----------|---------------------|---|
| Ax +/-   | Diff./TTL/24 V*     | Dig. input and output (with 24 V* only input) |
| Bx +/-   | Diff./TTL/24 V*     | Dig. input and output (with 24 V* only input) |
| Cx +/-   | Diff./TTL/24 V*     | Digital input                                 |
| Dx +/-   | Diff./TTL/24 V*     | Digital input                                 |
| Ex       | 24 V / 5 V optional | Digital input                                 |
| Fx       | 24 V / 5 V optional | Digital input                                 |
| Gx       | 24 V / 5 V optional | Digital input                                 |
| Hx       | 24 V / 500 mA       | Digital output                                |

x: Number of the function module (see pin assignment page 123)

\*with the APCI-1710-24V



## Specifications

### Counter components

Counting depth: 32-bit, Counting frequency: up to 5 MHz

### Free programming of the functions

32-bit or 16-bit acquisition of incremental encoders  
 Acquisition of absolute encoders/SSI  
 Counter/timer  
 Chronos/TOR for frequency measurement  
 Pulse acquisition  
 Chronos for pulse width modulation  
 Chronos for period duration measurement  
 TOR for velocity measurement  
 BiSS-Master  
 Digital I/O, 24 V, TTL, RS422  
 PWM  
 ETM  
 Customised functions

### Signals

Digital I/O signals, TTL or RS422

### Inputs

|  |   |
|--|---|
| Number of inputs:                                    | 20  |
| <b>Differential inputs or outputs</b>                |   |
| 5 V inputs:  | 8/16 (8 can be used as inputs or outputs)   |
| Nominal voltage:                                     | 5 VDC   |
| Common mode range:                                   | +12 / -7 V  |
| Max. differential voltage                            | ±12 V   |
| Input sensitivity:                                   | 200 mV  |
| Input hysteresis:                                    | 50 mV   |
| Input impedance:                                     | 12 kΩ   |
| Terminal resistor:                                   | 150 Ω serial with 10 nF (typ.)  |
| Signal delay:  | 120 ns (at nominal voltage)   |
| Max. input frequency:                                | 5 MHz (at nominal voltage)  |
| <b>Mass-related inputs, 24 V (channels E, F, G):</b> |   |
| Number of inputs:                                    | 12  |
| Nominal voltage:                                     | 24 VDC  |
| Input current:                                       | 11 mA (typical) at nominal voltage  |
| Logic input levels:                                  | Unominal: 24 V<br>UH max.: 30 V<br>UH min.: 19 V<br>UL max.: 15 V<br>UL min.: 0 V |
| Signal delay:  | 120 ns (at nominal voltage)   |
| Maximal input frequency:                             | 2.5 MHz (at nominal voltage)  |

### Outputs

|  |  |
|--|--|
| Nominal voltage:                                 | 5 VDC                                    |
| Maximum output frequency:                        | 5 MHz (diff. outputs)                    |
| Max. number of outputs:                          | 8 (if they are not used as diff. inputs) |
| <b>Digital outputs, 24 V:</b>                    |  |
| Output type:                                     | High-side (load to ground)               |
| Number of outputs:                               | 4  |
| Nominal voltage:                                 | 24 VDC                                   |
| Range of the supply voltage:                     | 10 V to 36 VDC (via 24 V ext. pin)       |
| Maximum current for 4 outputs:                   | 2 A typ. (limited to the voltage supply) |
| Maximum output current:                          | 500 mA short-circuit current/            |
| output at 24 V, $R_{load} < 0.1 \Omega$ :        | 1.5 A max. (output switches off)         |
| ON-resistance of the output (RDS ON resistance): | 0.4 Ω max.                               |

|   |   |
|---|---|
| Overtemperature:  | 170 °C (all outputs switch off)   |
| <b>Overtemperature protection (24 V outputs)</b>  |   |
| Activated:  | From approx. 150-170 °C (chip temperature)  |
| Deactivated (automatically):  | From approx. 125-140 °C (chip temperature)  |
| Outputs (at overtemperature):   | Outputs switch off  |
| <b>Protection against undervoltage</b> (effective at $V_{ext.} < 5 V$ ):  |   |
| Outputs (at undervoltage):  | All outputs switch off  |
| <b>Switching characteristics of the 24 V outputs</b>  |   |
| ( $V_{ext.} = 24 V, T = 25 \text{ °C}$ , ohmic load: 500 mA):   |   |
| Switch ON time:   | 200 μs  |
| Switch OFF time:  | 15 μs   |
| <b>Digital outputs, 5 V (option):</b>   |   |
| Output type:  | TTL   |
| Number of outputs:  | 4   |
| Nominal voltage:  | 5 VDC   |
| <b>Switching characteristics of the 5 V outputs</b> ( $T = 25 \text{ °C}$ , TTL load):  |   |
| Switch ON time:   | 0.06 μs   |
| Switch OFF time:  | 0.02 μs   |
| <b>Technical data for the APCI-1710-24 V board version</b>  |   |
| 24 V inputs (channels A to G). This board version is exclusively used for connecting 24 V encoders. Only 24 V signals can be connected to the input channels. |   |
| Nominal voltage:  | 24 VDC / 10 mA  |
| Max. input frequency:   | 1 MHz (at nominal voltage)  |
| Logic input levels:   | Unominal: 24 V<br>UH max.: 30 V<br>UH min.: 19 V<br>UL max.: 15 V<br>UL min.: 0 V |

### Safety

Optical isolation: 1000 V

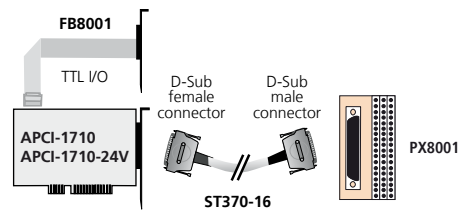
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 179 x 99 mm                                       |
| System bus:           | PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) |
| Space required:       | 1 slot  |
| Operating voltage:    | +5 V, ± 5 % from the PC<br>+24 V ext. /10 mA      |
| Current consumption:  | APCI-1710-x: 1.15 A typ. ± 10 %                   |
| Front connector:      | 50-pin D-Sub male connector                       |
| Additional connector: | Male connector for the TTL I/O function           |
| Temperature range:    | 0 to 60 °C (with forced cooling)                  |

### ADDI-DATA connection



## Ordering information

### APCI-1710

Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM,...  
 Incl. technical description and software drivers.

- APCI-1710:** Multifunction counter board, optically isolated.
- APCI-1710-24V:** 24 V for differential input signals (A and B for counter, I (Index) and UAS (error) signals).
- APCI-1710-5V-I:** 5 V inputs (E, F, G) instead of 24 V
- APCI-1710-5V-I-0:** 5 V inputs (E, F, G) instead of 24 V, outputs (H1, H2, H3, H4) 5 V instead of 24 V
- APCI-1710-10K20:** Same as APCI-1710, with additional function for connecting a **BiSS** interface

### Option

**Opt. 5V:** 5 V outputs (H1, H2, H3, H4) instead of 24 V

### Accessories

- ST370-16:** Shielded round cable, 2 m
- PX8001:** 3-row terminal panel for DIN rail
- FB8001:** Ribbon cable for connecting the TTL I/O function