

**Full/Half duplex RS484 SW300:**

Half duplex (e.g. BITBUS) is selected by setting switches 3,5 to ON and 4,6 to OFF. Half duplex means transmitting and receiving at the same pair of wires, in this case the free pair is used for the RTS signal (transmitter

controller). Full duplex is selected by switches 3,5 set to OFF and 4,5 set to ON.

**Analog inputs SW600/601:**

The eight analog inputs are configured with the two sets of switches SW600/601. If both switches for one particular input are set to OFF the input is configured for voltage (0...5V). By setting the oddly numbered switches (1,3,5,7) to ON a process current (0/4...20mA) can be measured, if the even numbers are set to ON a Si-temperature-sensor can be connected. Both switches set to ON must not be selected.

*Example:*  
 Analog i1 (1,2): 0/4...20mA  
 Analog i2 (3,4): 0...5V  
 Analog i3 (5,6): Si.-temp.-sensor  
 Analog i4 (7,8): 0...5V



**Termination RS485/BITBUS SW300:**

With switches 1,2,7,8 of SW300 termination resistors can be connected to the RS485 line. This has to be done at the physical end of the line and must not be done anywhere else. The termination is selected by choosing ON.

**Profibus (option) termination SW 51:**

For termination of the Profibus-line both switches have to be set to ON.

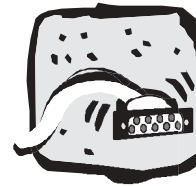
**Profibus (option) address SW80/81:**

With these two turn-switches the node address can be selected from 0 to 99. The settings A...F are not valid.



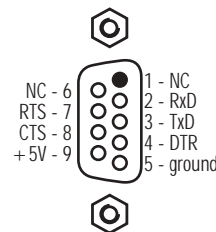
**User Configuration SW130:** *Example: Adr. 12*

This switch can be scanned by the application. (see "Software")



**Ser0 ST100 :**

(Programming interface)  
 The TSM-CPU is connected to the programming PC via this 9pin D-connector and a RS232-null-modem cable.

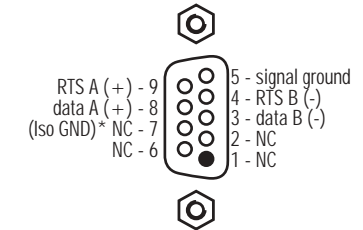


**Ser1 ST102 :**

RS232 peripherals are connected to the 9pin D-connector labeled with Ser1. The DTR signal is active, as long as the CPU is supplied with voltage. This universal peripheral interface can be addressed optionally either with mCAT-Serdrv or the "Simple-I0" functions.

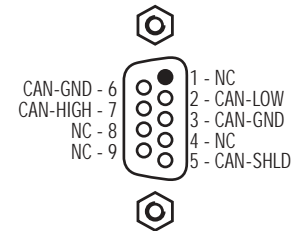
**RS485/BITBUS ST300 :**

Isolated RS485 interface at 9pin D-connector. Standard protocol is BITBUS. Termination and configuration for full duplex is set up with SW300. The yellow LED "Tx" indicates an active RTS.



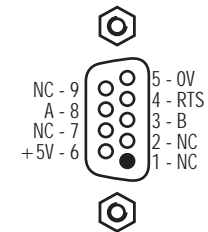
**Option: CAN-Bus ST185 :**

(Only available for TSM-CPUxH2x < CP)  
 Isolated CAN interface compliant with CIA DS-102. The CAN-Bus signals have to be terminated externally. A voltage supply through pin 9 is not supported.



**Option: Profibus ST50 :**

(Only available for TSM-CPUxH2x < CP)  
 Isolated Profibus interface. Address selection with SW80/81. The Profibus lines can be terminated with SW51. 5 LED's (Aux, Diag., Off, Online, P.-Stat.) display the momentary status.



**Relay ST120 :**

The potential free changeover contact of the relay can switch up to 60W (max. 2A, max. 125V). The green LED "Rel" displays the status. The front panel of the module shows the relay standing by.



# TSM-CPUxH2x < x

## TSM rail CPU



The module is being shipped with a mCAT2 realtime core (with BITBUS drivers) in the flash EPROM. It can be programmed in C with cross-compilers in DOS/Windows. □

All of the eight analog inputs (analog i1...i8) are supported by Express-I/O at the "ranges": 0...5V, 4...20mA, KTY (-25...102 °C), PT100V4 (-50...205 °C) and LM34(-10...100 °C).

Example (temperature measurement with KTY-sensor at analog i1):

```
/* create */ IOObjCreate(&processtemp, NULL, BUS_TYPE_CPU, CPU_AIN, 0, CLASS_ANALOG, NULL);
/* config */ CFG(&processtemp, CFG_SET_CHANNEL_RANGE, RANGE_KTY);
/* read */ temp = IN(&processtemp); /* temp in 1/10 °C */
```

The two analog outputs (analog o1, o2) only support the "range", 0...10V.

Example (frequency inverter 0...10V at analog o2):

```
/* create */ IOObjCreate(&inverter, NULL, BUS_TYPE_CPU, CPU_AOUT, 1, CLASS_ANALOG, NULL);
/* config */ CFG(&inverter, CFG_ENABLE, TRUE);
/* write */ OUT(&inverter) = voltage; /* voltage in mV */
```

Express-I/O supports all digital inputs with the functions "normal" input, edge detector and event counter. The minimum sampling time of the edge detector and the counter is 5 ms (max. 100 Hz). Additionally two inputs (i1, i4) can be used as event counter (16bit hardware counter) or several inputs (max. 8, depending on how many of the hardware counters are used) as frequency counter. By single selection of frequency counting a group of four are switched to frequency counting. For details see the Express-I/O documentation.

Example event counter (event counter impulses at i6):

```
/* create */ IOObjCreate(&energy, NULL, BUS_TYPE_CPU, CPU_DIN, 5, CLASS_DIGITAL, "COUNTER");
/* config */ CFG(&energy, XP_CFG_SET_SAMPLE_RATE, 5);
/* clear */ OUT(&energy) = 0;
/* read */ pulse = IN(&energy);
```

The flexible pulse function of Express-I/O can as well be used for all digital outputs and the relay. Two digital outputs (o1, o2) can also be used as 8bit PWM output.

Example PWM (analog valve [24V] at o1):

```
/* create */ IOObjCreate(&pwmvalve, NULL, BUS_TYPE_CPU, CPU_PWM, 0, CLASS_PWM, NULL);
/* write */ OUT(&pwmvalve) = value; /* value in 1/10% */
```

Configuration switch (SW130) can be read at the lowest 4bit of address 68h. In standard set-up the red "Info"-LED blinks at a 1Hz rhythm (caused by mCAT). It can also be controlled by the application.

Further detail about mCAT, drivers and Express-I/O can be found in the mCAT documentation.

### TSM-Bus ST200 :

Up to 14 i/o-modules can be connected. The maximum number of connected modules is generally limited by their power consumption. The maximum current of all modules may not exceed 3A. At its physical end (last module or on the CPU itself if no module is connected) the bus has to be terminated with the enclosed terminator.

### Voltage supply ST1/2 :

At ST1 and ST2 the module has to be supplied with 24V. The two connectors are internally connected in parallel, so supply voltage can be obtained from the 2nd connector.

The module (except for 24V-i/os) and the TSM-Bus are supplied from the supply voltage via the internal voltage regulator.

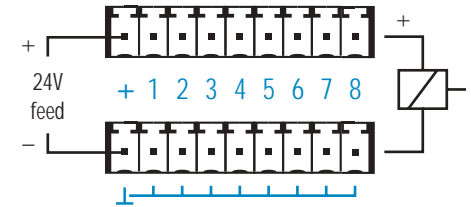
### Option: Backup battery ST90 :

**Caution !** If no 3,6V battery is connected the pins have to be bridged with a jumper.

### Option: digital outputs ST550/551 :

(Only available for TSM-CPUxH2EA < x)

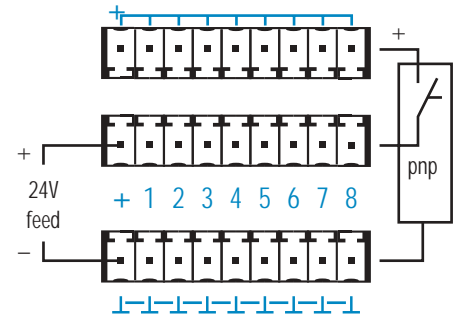
The version "EA" of the CPU has 8 digital 24V outputs for eight 24V-D/C-devices. The outputs are short circuit protected, p-switching and isolated against the control side. Each output (ST500) switches 500mA, has its own ground contact (ST501) and a yellow LED for status display. The 24V supply of the outputs has to be connected as can be seen on the picture.



### Option: digital inputs ST503/501/502 :

(Only available for TSM-CPUxH2EA < x)

Beside the 8 outputs, there are also 8 digital inputs, that are isolated against the CPU. They are suitable for p-switching transducers and expect 24V nominal for an active input. Each input (ST501) has a red LED as well as a 24V (ST503) and a ground contact (ST502). PNP-transducers can be connected directly. In special cases (transducers with OC-outputs that have their grounds connected) the internally connected grounds of the inputs can be disjoint.



**Caution !** ground connections < 100mA load (no busbar)

### Option: analog i/o ST600/601 :

(Only available for TSM-CPUxH2EA < x)

The eight analog inputs (analog i1...i8) each have 10bit resolution and can be configured for either 0...5V, Si-temperature-sensors or process current 0/4..20mA. Details can be found at SW600/601. Both analog outputs (analog o1, o2) can put out 0...10V at 8 bit. The oddly numbered analog i/os are found at ST600 together with a ground contact, the evenly numbered at ST601. Both connections for the analog ground are connected to the internal CPU-ground but should be kept separate externally.

