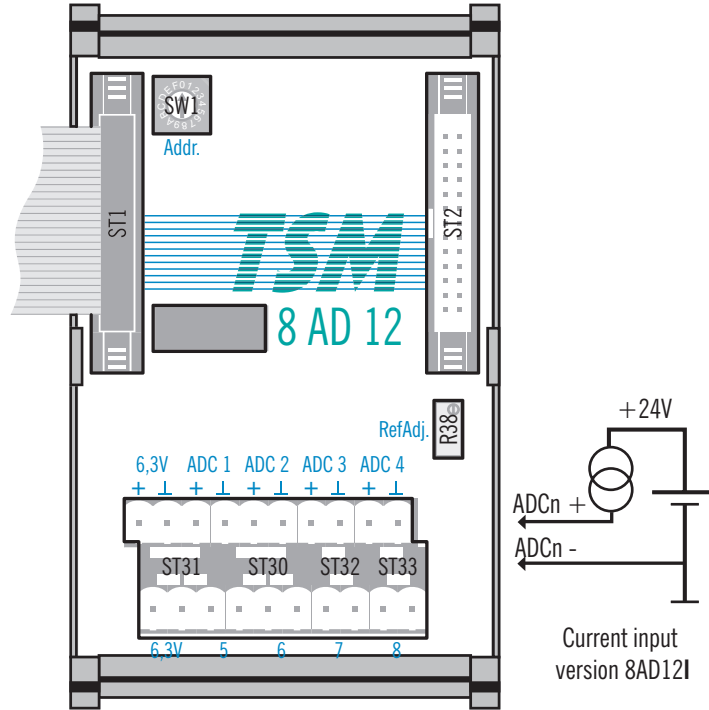




# TSM-8AD12

## analog input rail mount module



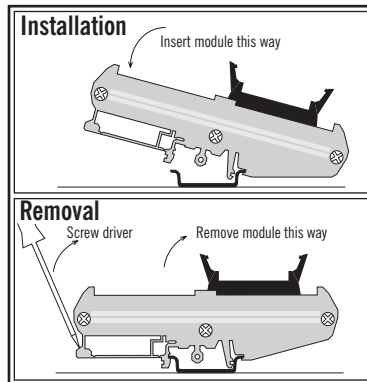
**Installation:**

To install or remove a module, first remove power from the TSM rail.

For proper operation, only the TSM cables to neighbouring modules are required or a

terminator on the right side connector of the last module in a row. The terminals marked 6.3V provide this voltage for low current sensors like for instance LM335 temperature sensors.

Connect input voltages as indicated on the boards front panel. For the current input version (8AD121) of this board, see the drawing above.



**Set the modules address (SW1):**

A screwdriver is used to set the modules address. The position set in the drawing is address "0".

**Set the addresses according to the specifications of your software engineer.**

Numbers 0..9 and letters A..F are marked on the rotary switch. The letters A..F correspond to numbers 10 to 15, i.e. A-10, B-11, C-12, D-13, E-14, F-15. 0 is a valid value, hence the 16 possible addresses are in the range of 0..15. When changing a module it is a good idea to set the address of the new module to the same that it is going to replace. You might secure a set position with a little drop of sealing wax.



**Analog inputs (ST31/30/32/33):**

The module TSM-8AD12 has 8 analog inputs (ADC1..ADC8) and is supplied in two versions, the standard for voltage inputs 0..5V, 0..10V, +/-5 or +/-10V and the process current version for 0/4..20mA (see the connection schematic in the drawing). The current input version is marked "8AD121" and has a load of 250 Ohms. The MAX197 ADC used on the board is a fast 6.3μs ADC with the drawback of a low input resistance. Hence, we have added high impedance voltage followers to each input plus low leakage protection diodes. All inputs can

be set to different voltage ranges if required. Switching between voltage and current input, however requires a hardware modification (shunt resistor).



While raw access to the board is detailed below, usually you will access the TSM-8AD12 through mCAT's "Express-I/O".

mCAT supports this board with the IN-function like: `IN(&pressure5)`.

When creating an I/O object, set the class to `CLASS_ANALOG`, like in: `IOObjCreate(&pressure5, NULL, BUS_TYPE_TSM, 0, 4, CLASS_ANALOG, NULL)` for an input to ADC5 on an 8AD12 module with the rotary switch set to "0". Then use the `CFG_SET_CHANNEL_RANGE` function to set the input range for each channel. The mCAT manual describes this in detail.

**Range identifier**

**Physical input range / scaled return value**

RANGE_RAW	Binary
RANGE_RAW_U_10000	0..4095, 0..10V
RANGE_RAW_U_5000	0..4095, 0..5V
RANGE_RAW_S_10000	-2048..+2047, -10..10V
RANGE_RAW_S_5000	-2048..+2047, -5..5V
RANGE_U_10000	0..10000mV
RANGE_U_5000	0..5000mV
RANGE_S_10000	-10000..10000mV
RANGE_S_5000	-5000..5000mV
RANGE_PT100V4*	-500..+2050dC
RANGE_020mA**	0..20000μA
RANGE_420mA**	0..20000μA

\* Requires external PT100V4 signal conditioner  
 \*\* TSM-8AD121 only

**Raw access information**

Bit	7	6	5	4	3	2	1	0	
+1									(WR)
+0	PD1	PDO	AQM	RNG	BIP	CH2	CH1	CH0	(WR)
+1				Sign	MSB	Bit11	Bit10	Bit9	(RD)
>+0	Bit8	Bit7	Bit6	Bit5	Bit3	Bit2	Bit1	LSB	(RD)

① x4 = Base address + 10000H

ID-Address (=Base+80H)	HW-ID 01 <sub>H</sub>							
+3	0	0	0	0	0	0	0	1
+2		0	0	1	1	0	1	1
+1		0	0	1	1	0	1	1
>+0		0	0	1	1	0	1	1

/ADRDY                      Module-ID 1B