

# MAO-4

## Technical Documentation Analog Output Submodule

*Please keep for further use !*

Edition date/Rev. date: 16.12.1998  
Document no./Rev. no.: TRS - V - BA - GB - 0033 - 00  
Software version: 1.0  
File name: TRS-V-BA-GB-0033.DOC  
Author: MUH

**TRSystemtechnik GmbH**  
**Eglishalde 6**  
**D-78647 Trossingen**  
Germany  
Tel. +49 - (0) 7425 / 228-0  
Fax +49 - (0) 7425 / 228-34

## Imprint

### **TRSystemtechnik GmbH**

D-78647 Trossingen  
Eglisshalde 6  
Tel.: (+49) 07425/228-0  
Fax: (+49) 07425/228-34

© Copyright 1998 TRSystemtechnik

## **Guarantee**

In our ongoing efforts to improve our products, TRSystemtechnik reserve the right to alter the information contained in this document without prior notice.

## **Printing**

This manual was edited using text formatting software on a DOS personal computer. The text was printed in *Arial*.

## **Fonts**

*Italics* and **bold** type are used for the title of a document or to emphasize text passages.

Passages written in *Courier* show text which is visible on the display as well as software menu selections.

"< >" refers to keys on your computer keyboard (e.g. <RETURN>).

## **Note**

Text following the "NOTE" symbol describes important features of the respective product.

## **Copyright Information ©**

MS-DOS is a registered trademark of Microsoft Corporation.

## Revision History

**i**

**Note:**

The cover of this document shows the current revision status and the corresponding date. Since each individual page has its own revision status and date in the footer, there may be different revision statuses within the document.

Document created:

16.12.1998

Revision	Date

## **Table of contents**

<b>1 General .....</b>	<b>5</b>
<b>2 Data format .....</b>	<b>6</b>
<b>3 Adjustment .....</b>	<b>6</b>
<b>4 Analog outputs.....</b>	<b>7</b>
4.1 Pin configuration of the analog outputs.....	7
<b>5 Connection hints.....</b>	<b>7</b>
<b>6 Technical data of MAO-4.....</b>	<b>8</b>
<b>7 Pin configuration front connector .....</b>	<b>8</b>

# MAO-4



Eglshalde 6, 78647 Trossingen,  
Germany Tel. +497425-228-0, Fax +497425-228-34

## MAO 4 Analog Output Submodule

### 16-Bit Resolution -10..+10V, 0.. +10V

#### 1 General

The MAO-4 output module is a submodule for the FOX-20 basic module. The submodule provides four digital outputs which are separated galvanically. For operation in the I/O system, you can install up to four MAO-4s in the four slots of a FOX-20 basic module. This makes possible a maximum of 16 analog outputs per FOX-20. In addition, you can combine MAO-4s with different modules, e.g. digital outputs.

The module is available in 3 versions:

- MAO-4 +-10 V
- MAO-4 +-10 mA
- MAO-4 +-20 mA

The four channels always have a 16-bit resolution.

Besides, the 4 analog inputs are layed over 100 ohm resistors on test sockets on the front panel. To these an external measuring system can be connected, for example when putting into operation.

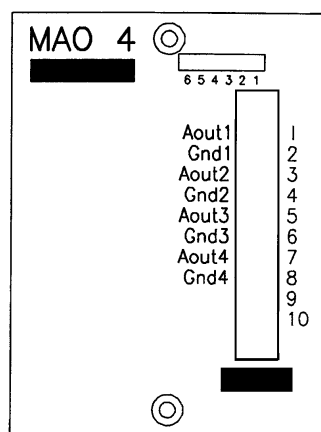


Figure 1: Front view MAO-4

## 2 Data format

Type	Output areas and corresponding data words	resolution
+ - 10V	8000H _____ 0H _____ 7FFFH -10V _____ 0V _____ +10V	16 bit
+ -10mA	8000H _____ 0H _____ 7FFFH -10mA _____ 0mA _____ +10mA	16 bit
+ -20mA	8000H _____ 0H _____ 7FFFH -20mA _____ 0mA _____ +20mA	16 bit

**Hint:**

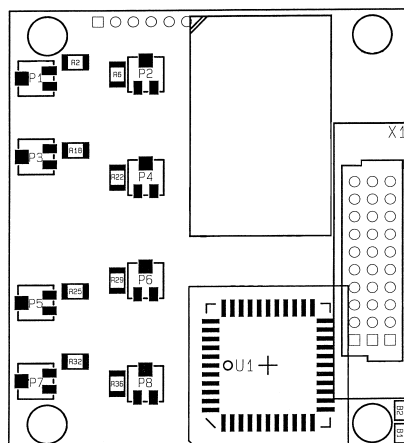
A module with voltage output cannot be changed by the user to a module with current output (or vice versa).

## 3 Adjustment

At the moment of delivery, the module is adjusted, the corresponding potentiometers are secured with varnish. If a later adjustment should nevertheless become necessary, a short adjustment instruction follows now.

The adjustment of the voltage version and the current versions is in principle the same :

- Switch on module a few minutes (operating voltage)
- Output 000H on corresponding channel
- Adjust output with corresponding offset potentiometer to 0
- Output +7FFFH on corresponding channel
- Adjust output with corresponding gain potentiometer to positive maximum value
- Output 8000H on corresponding channel
- Check negative maximum value



channel	gain	offset
1	P1	P2
2	P3	P4
3	P5	P6
4	P7	P8

**Figure 2: position and meaning of the potentiometers**

## 4 Analog outputs

In order to enable an external measuring system (for example an analog writer) to record the measured value, there are two 3-pole connectors with analog outputs on the front panel. The measuring signals are layed over 100 ohm on these outputs, consequently they may only be loaded with high impedance.

At modules with voltage output, the output voltage can be measured at these analog outputs. At modules with current output, the voltage that is output at the internal current measuring resistor is on these outputs.

### 4.1 Pin configuration of the analog outputs

Pin	Output
1	GNDa
2	channel 1
3	channel 2
4	channel 3
5	channel 4
6	GNDa

## 5 Connection hints

In order to reduce electro-magnetic interference, the housing of the FOX-20 basic module must be earthed and the front panels of the submodules must be screwed. The lines of the analog outputs have to be shielded and the shield has to be layed on mass at both line ends. The ferrite ring that is added to the module is put around the outgoing analog data line (see draft).

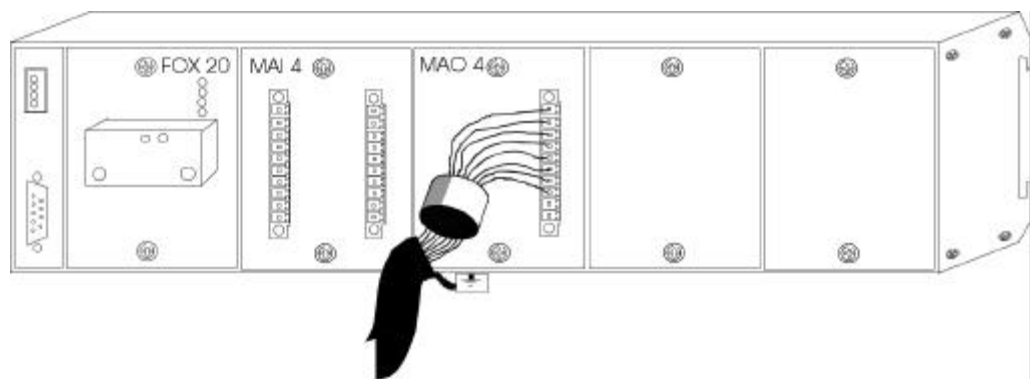


Figure 3: shield connection

## 6 Technical data of MAO-4

<b>Outputs</b>	Four analog outputs, galvanically decoupled
<b>Output Levels</b> version +-10 V version +-10 mA version +-20 mA	-10 V .. +10 V, I <sub>max</sub> = 10 mA -10 mA .. +10 mA, U <sub>max</sub> = 10 V -20 mA .. +20 mA, U <sub>max</sub> = 10 V
<b>Decoupling</b>	Submodule is galvanically separated by optocoupler to the basic module
<b>Resolution</b>	16-bit (1 digit = 305 µV)
<b>Supply Voltage</b>	24 V DC (±20%)
<b>Current Consumption</b>	0.05 A (without load and input currents)
<b>Housing</b>	Module with front panel is mounted in the FOX-20 using two screws.
<b>Dimensions (W x H x T)</b>	58 x 72 x 50 mm
<b>Weight</b>	Approx. 100 g
<b>Operating Temperature</b>	±0..+55° C
<b>Storage Temperature</b>	-20..+70° C

## 7 Pin configuration front connector

Pin	Signal	Description
R-1	AOut1	Analog output, channel 1
R-2	GND1	Ground, channel 1
R-3	AOut2	Analog output, channel 2
R-4	GND2	Ground, channel 2
R-5	AOut3	Analog output, channel 3
R-6	GND3	Ground, channel 3
R-7	AOut4	Analog output, channel 4
R-8	GND4	Ground, channel 4
R-9		Not assigned
R-10		Not assigned

Pin designations: L: left-hand row  
M: middle row  
R: right-hand row