

Integrated module with galvanically separated voltage/current output and CAN bus interface for control applications

Features

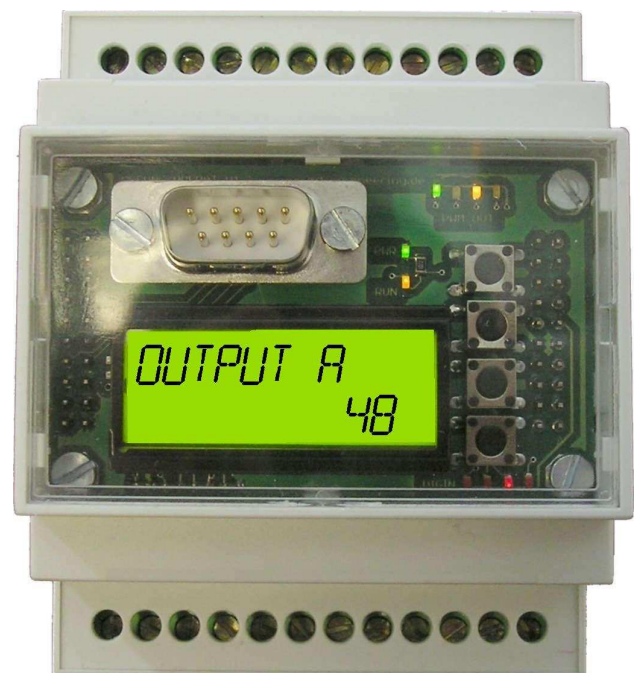
- voltage output 0-10 V
- current output 0-20 mA
- independent optocoupler output with open emitter and collector (PWM driven)
- galvanically separated inputs and outputs (except analog inputs)
- 3 analog inputs 0-10 V
- 8 V supply output for analog inputs
- 4 digital inputs 10-30 V
 - 2 frequency / duty cycle inputs
- power supply 10-30 V
- CAN bus interface
 - secure MDCAN realtime protocol
 - MDFUNC series compatible
 - MDCAN series compatible
 - NAVIO series compatible
- configurable on-chip software
 - MDFUNC_{I/O} input vs. output matrix
 - select an input out of more than 30 sources for each output channel or link function
 - several automatic control functions (P/PID/RPM)
 - latch function
 - triple station control
 - logic functions
 - transfer function (input vs. output)
 - RS232 interface or USB interface
 - configuration and monitoring with LC display
 - comfort configuration and monitoring with free PC-Tool
 - MDFUNC_{I/O} Tool
 - easy to use
 - more possibilities, more functions
 - firmware upgrades
- status indication by LEDs
- safety feature for AIN/CANbus cable break
- mountable on 35 mm DIN-rail
- max. cable diameter for connectors: 1.5mm² with ferrule

Applications

Galvanically separated analog output module for mobile and marine applications, valve controls, engine controls, control systems, input/output CAN bus node

- speed request for marine or industrial engines
 - suitable for Steyr, Deutz etc. engines
- in combination with MDFUNC-PWM modules suitable for propulsion systems
 - hydraulic propulsion systems
 - RPM control
 - mechanical clutches with soft shifting
 - mechanical clutches with trolling function
 - RPM control
 - emergency controls
- hydraulic valve controls
 - simple controls
 - automatic position control
- pressure control

MD engineering GmbH can help to choose the right components and implement your application.



Description

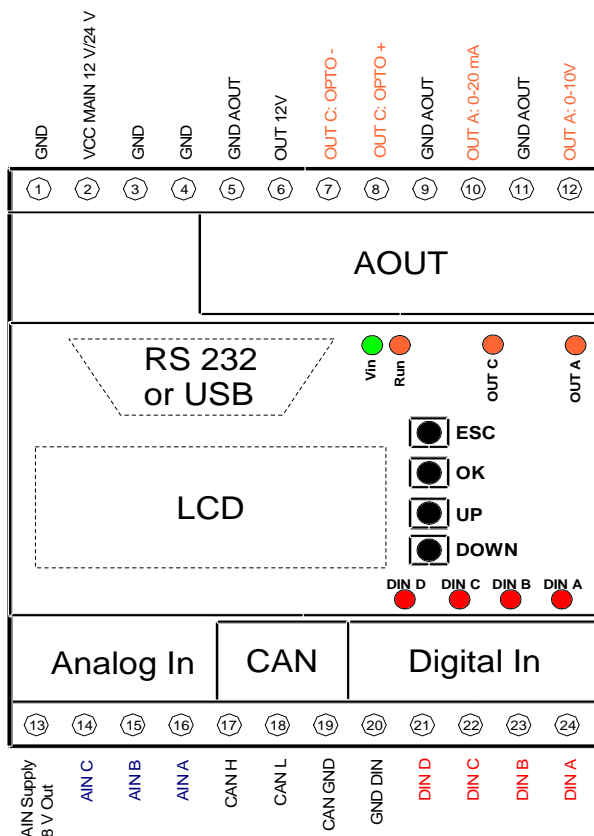
The MDFUNC-AOUT2 unit is a pre-programmed and easy to use I/O module to control all types of voltage or current inputs. Additionally the unit has an independent opto-coupler output, which can be used as a PWM output (a duty cycle can be set).

Three analog, four digital inputs and a CAN-interface are available. Two of the digital inputs can also be used for frequency measurements (i.e. read engine revolutions) or to measure the duty cycle.

The MDFUNC-AOUT2 uses the new MDFUNC_{I/O} -engine, which offers more powerful possibilities for creating your control application. Functions like multiple station control, network control or positioning control are pre-programmed and easily accessible. The onboard LC-display has multiple language support (English, German, Dutch), offers monitoring functions and the possibility to change module parameters. For configuring the module more comfortable, the new PC-Tool MDFUNC_{I/O} is available at the support site. A PC can be connected via RS232 serial port or via USB (hardware option).

Furthermore internal data can be displayed on the CAN-bus and multiple units can be linked to a network.

Connection diagram



Connector description

supply

1,3,4	GND	main system and analog input ground
2	V _{CC MAIN}	main system supply

inputs

analog inputs		
16,15,14	AIN A/B/C	analog inputs
digital inputs		
24,23,22,21	DIN A/B/C/D	digital inputs
20	GND DIN	digital ground, reference potential for
CAN-Bus (I/O)		
17,18	CANH,CANL	CAN bus connectors
19	CAN GND	CAN bus ground

outputs

13	AIN Supply 8V	supply for passive analog devices: e.g. joysticks, potentiometers etc.
5,9,11	GND AOUT	analog output ground
6	OUT 12V	fixed analog output 12V (max. 20 mA), can be used to source the optocoupler output
12	OUTA 10 V	voltage output
10	OUTA 20 mA	current output
8,7	OPTO +/-	open optocoupler outputs

Button description

UP/DOWN	switch through current menu / in/decrease a value
OK	jump in submenu / select value for edit / accept edited value
ESC	jump out of submenu / cancel value edit

Software assignments

Output A	voltage/current output
Output B	free, calculation channel
Output C	optocoupler output
Output D	free, calculation channel
Output E	free, calculation channel

Electrical Characteristics

($T_{env} = 25^{\circ}\text{C}$)

Power supply

Symbol	Parameter	min	typ.	max.	abs max.	Unit
V_{in}	system power supply voltage DC	10	12/24	30	32	V
$I_{in} @ 12\text{ V}$	system current (with LCD)		180			mA
$I_{in} @ 24\text{ V}$	system current (with LCD)		90			mA
T_{env}	environment temperature	-10	25	50	60	$^{\circ}\text{C}$

Analog Output A

- galvanically separated
- self powered (internal DC/DC converter, 12V), stabilised
- branded analog circuitry
- 12 bit DAC, for Application: 1000 steps from 0 to 10 V / from 0 to 20 mA
- startup stable output signal time: 130 ms (can be switched down to 25 ms)
- limitable output range

Voltage output

Symbol	Parameter	min	typ.	max.	abs max.	Unit
U_{out}	analog output voltage	0	-	10.75	-	V
R_{out}	output impedance	230	235	240	-	Ω
$R_{L,min}$	minimum load resistance	7	10	-	-	k Ω
$I_{max} @ 10\text{ V}$	maximum current to reach 10 V output	-	-	1.5	-	mA
I_{max}	short circuit current, self limited	-	-	45	-	mA
$U_{n,pk-pk}$	Ripple and noise (20 MHz Bandwidth, peak to peak)	-	120	-		mV
$U_{n,rms}$	Ripple and noise (20 MHz Bandwidth, rms)	10	17	25		mV

Current output

Symbol	Parameter	min	typ.	max.	abs max.	Unit
I_{out}	analog output current	0	-	21.5	-	mA
R_{out}	output impedance	48	50	52	-	Ω
$R_{L,min}$	maximum load resistance			500	-	Ω
U_{max}	open circuit	11,8	12	12,6	-	V

Analog Output C

- galvanically separated
- PWM frequencies: 30 Hz, 120 Hz, 245 Hz, 490 Hz, 975 Hz, 3900 Hz
- output stage of optocoupler Vishay: ILD206
 - emitter: OPTO+
 - collector OPTO-
 - for details please refer to datasheet ILD206
- on-state input LED-current = 5 mA
- compatible with Caterpillar ADEM-II-6, ADEM-II-16 EMC, PEEC 3

Digital Inputs A/B/C/D/E/F/G/H

- inputs galvanically separated

Symbol	Parameter	min	typ.	max.	abs max.	Unit
V _{DIN,H}	voltage for high level	3.5	12/24	28	32	V
V _{DIN,L}	voltage for low level	-0.5	0	2.5	-	V
t _{S,DIN}	turn on/off time (sample time)	-	1	3	-	ms
I _{DIN @ 24 V}	current per channel	1.0 ¹	11.0 ²	12	-	mA
f _{DINA}	input frequency range	5	-	5000	7000	Hz
f _{rDINA}	input frequency resolution	1 ³	-	14 ³	-	Hz
Δf _{DINA}	input frequency deviation	-	0.5	2	-	%
t _{fDINA,stop}	frequency measurement stop time	200	300	500	-	ms
d _{C_{DINA}} ⁴	input duty cycle range	3.0	-	97.0	-	%
d _{C_{rDINA}} ⁴	input duty cycle resolution	0.1	-	0.4	-	%
Δd _{C_{DINA}} ⁴	input duty cycle deviation	-	0.5	3	-	%

¹ @ V_{DIN} = 3.5 V

² optocoupler: 5.5 mA, LED: 5.5 mA

³ 1 Hz resolution up to 300 Hz; 14 Hz resolution at 5 kHz

⁴ accuracy of duty cycle measurement depends on the signal's slew rate and frequency

Attention: input frequencies above 7 kHz slows down the performance of the MDFUNC-ADIN.

Analog Inputs A/B/C

- averaged values
- overvoltage protected input

Symbol	Parameter	min	typ.	max.	abs max.	Unit
V _{AIN}	analog input voltage	0	-	10	11	V
R _{AIN}	input impedance	50 ⁴	94	110	-	kΩ
f _{sample}	internal register update frequency	-	400	-	-	Hz

⁴ input impedance decreases, when V_{AIN} is higher than 11.2 V

AIN supply output

- V_{sup,AIN} = 8 V
- I_{sup,AIN,max} = 90 mA
- output not galvanically separated

CAN bus interface

- galvanically separated
- connectors with CANH and CANL
- max. bus length: 40 m..1000 m
- selectable CAN bus speed: 50, 125, 250, 500, 1000 kBit/s
- blinking RUN-LED and blinking antenna symbol on LCD, when bus OK
- 3 free 16 bit inputs (MDCAN protocol)
- 3 free 8 bit inputs (MDCAN protocol)
- MDCAN protocol output (10 Hz):
 - analog inputs A/B/C
 - digital inputs (A/B/C/D)
 - frequency input (DINA)
 - latch status results (A/B/C/D/E)
 - output channels (A/B/C/D/E)

RS232 connection

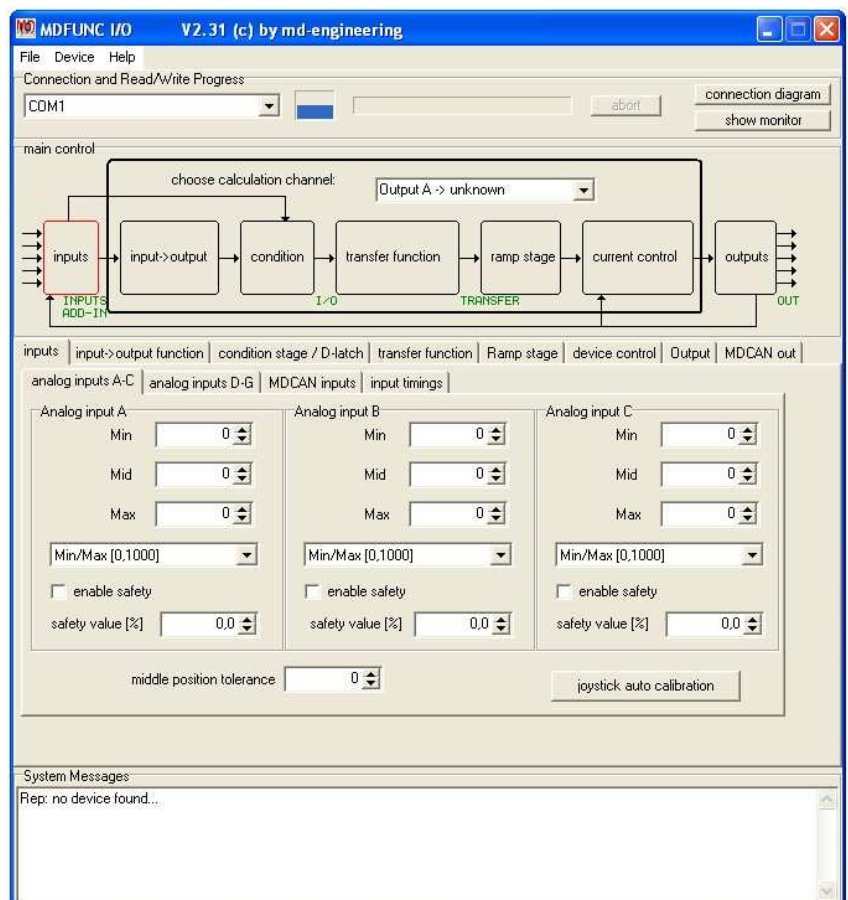
- not galvanically separated
ATTENTION when using PC with grounded outlet power supply GND_{PC} must have the same potential as GND_{PWM3} . If the difference is more than 100 mV you can damage the AOUT2 and your PC. Best use a laptop powered by battery.
- SUB-D 9 pin male connector on board
- connect common zero modem cable to port (also possible with "USB/RS232" adapter)
- data connection: 57600,8,N,1

USB connection

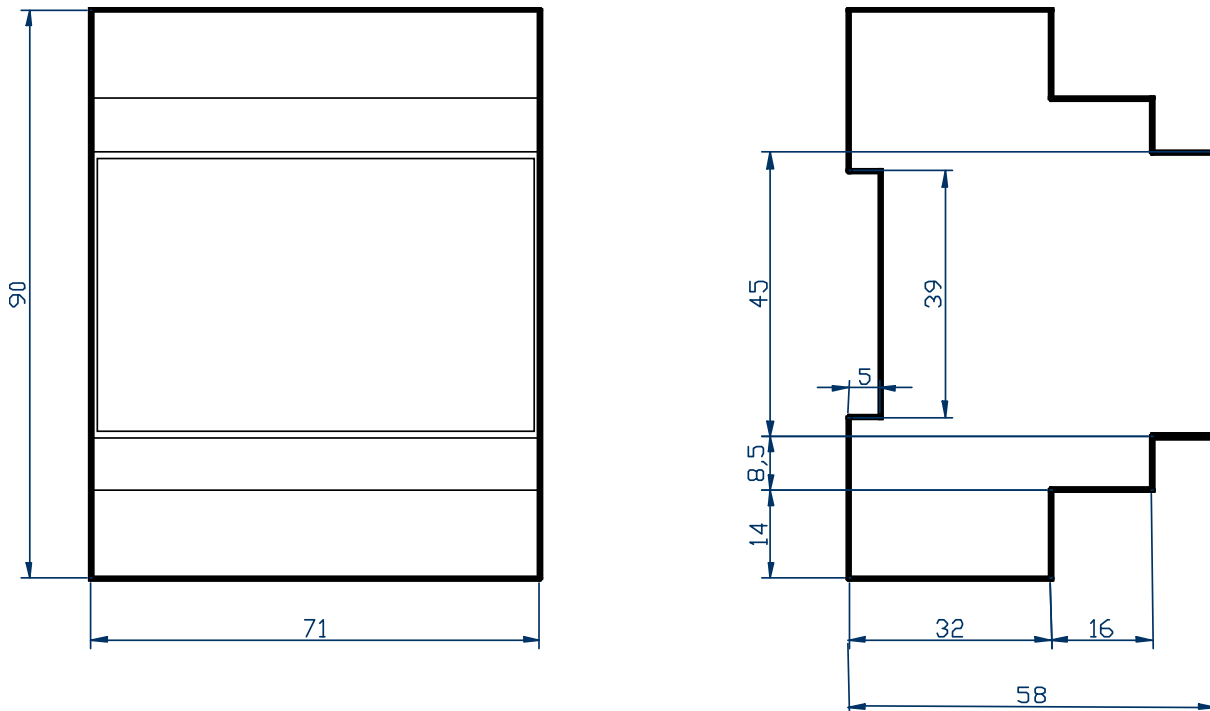
- not galvanically separated
ATTENTION when using PC with grounded outlet power supply GND_{PC} must have the same potential as GND_{PWM3} . If the difference is more than 100 mV you can damage the AOUT2 and your PC. Best use a laptop powered by battery.
- Mini-USB connector 5 pin on board
- USB 1.1 standard
- connect AOUT2 with common Mini-USB cable to your PC
- on board USB/RS232 adapter, device will appear as COM-port on your PC
- RS232 data connection: 57600,8,N,1
- driver for free download

Setup Program: MDFUNC-I/O Tool Version 2.3

- more possibilities, better overview
- easy user interface
- free input-output combinations
- inputs from local analog inputs, digital inputs, CAN bus inputs or system outputs for feedback
- boolean operations, latch function
- CAN bus inputs/outputs
- Input vs. Output transfer function
- Ramp functions with gain and offset limitation
- monitor functions
- load/save settings from/to file
- special functions: automatic control, multiple station control
- Requirements:
 - Win2000/XP
 - CPU with 600 MHz or higher
 - COM port or USB port



Package dimensions (in mm)



Order codes

AOUT2 with RS232 connector
MDFUNC-AOUT2-RS232-LCD

AOUT2 with USB-connector
MDFUNC-AOUT2-USB-LCD

RS232-PC connection cable
MDCABLE-RS232-ZERO

USB-PC connection cable
MDCABLE-MiniUSB

Please ask for special device programming, other CAN protocol stacks or our "low cost solutions" (e.g. not galvanically separated or no LCD).

Support

Get datasheets, drivers, firmware, software and examples from:

<http://www.md-engineering.de/produkte/mdfunc/main.html>