

## Integrated fullbridge (H bridge) module with CAN bus interface for DC motor control applications

### Features

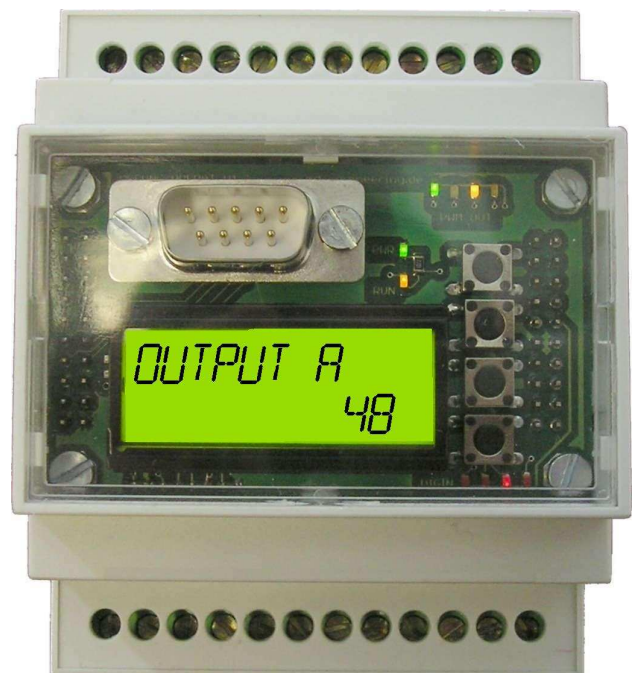
- Fully integrated H-Bridge motor drive (Fullbridge)
  - 0-32 V
  - 0-10 A
  - Undervoltage and overvoltage shut-down
  - Overvoltage clamp
  - Thermal shut down
  - Cross-conduction protection
- 3 analog inputs 0-10 V
- 8 V supply output for analog inputs
- 4 galvanically separated digital inputs 10-30 V
  - 1 frequency / duty cycle input
- 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<sub>I/O</sub> 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<sub>I/O</sub> 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: 1.5mm<sup>2</sup> with ferrule

### Applications

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

- mechanical engine actuator control (e.g. BOSCH actuator)
- hydraulic pumps control
- hydraulic valve controls
  - simple controls
  - automatic position control
- DC motor driver/control
- Window lifts
- Seat positioners

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



## Description

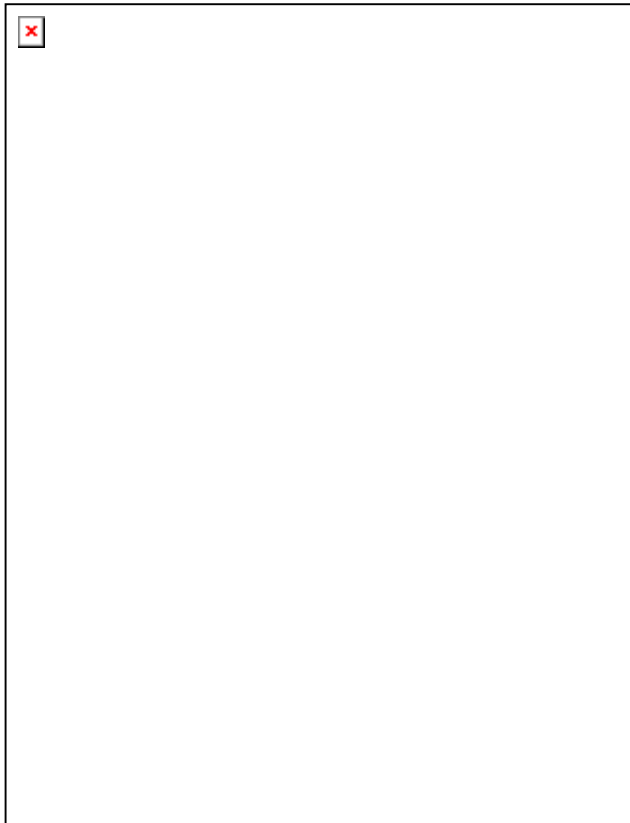
The MDFUNC-FB unit is a pre-programmed and easy to use H bridge module for mechanical actuator control.

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

The MDFUNC-FB module uses the new MDFUNC<sub>I/O</sub> - 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<sub>I/O</sub> 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	GND	main system and analog input ground
2	V <sub>CC MAIN</sub>	main system supply

### inputs

16,15,14	AIN A/B/C	analog inputs
24,23,22,21	DIN A/B/C/D	digital inputs
20	GND DIN	digital ground, reference potential for digital inputs
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.
3,5,6	GND	analog ground
7,8	FBOUT-	negative output: <ul style="list-style-type: none"> <li>• Output A &gt; 0%: pulsed GND</li> <li>• Output A &lt; 0%: pulsed VCC</li> </ul>
11,12	FBOUT+	positive output: <ul style="list-style-type: none"> <li>• Output A &gt; 0%: pulsed VCC</li> <li>• Output A &lt; 0%: pulsed GND</li> </ul>
4,9,10	VCC	+24V

## 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	output value (in free configuration mode) -> FBOUT+, FBOUT-
Output A	requested actuator position (in Bosch-actuator mode) -> automatic output control at FBOUT+, FBOUT-
Output B	free, calculation channel
Output C	free, calculation channel
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	60	70	$^{\circ}\text{C}$

### H-bridge

- Undervoltage and overvoltage shut-down
- Overvoltage clamp
- Thermal shut down
- Cross-conduction protection
- Linear current limiter
- Very low standby power consumption
- Protection against loss of ground and loss of VCC

Symbol	Parameter	min	typ.	max.	abs max.	Unit
$V_{out,FB}$	PWM-stage supply voltage DC	10	12/24	29	32	V
$I_{out,FB}$	continuous current	-10	-	+10	+/-13	A
$f_{PWM,A/B}^1$	frequency range channel A and B	100	-	1000	-	Hz
$R_{on}$	on state resistance	-	45	-	-	m $\Omega$

### 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
$I_{DIN} @ 24\text{ V}$	current per channel	1.0 <sup>1</sup>	11.0 <sup>2</sup>	12	-	mA
$f_{DINA}$	input frequency range	5	-	5000	7000	Hz
$f_{rDINA}$	input frequency resolution	1 <sup>3</sup>	-	14 <sup>3</sup>	-	Hz
$\Delta f_{DINA}$	input frequency deviation	-	0.5	2	-	%
$t_{fDINA,stop}$	frequency measurement stop time	200	300	500	-	ms
$dC_{DINA}^4$	input duty cycle range	3.0	-	97.0	-	%
$dC_{rDINA}^4$	input duty cycle resolution	0.1	-	0.4	-	%
$\Delta dC_{DINA}^4$	input duty cycle deviation	-	0.5	3	-	%

<sup>1</sup> @  $V_{DIN} = 3.5\text{ V}$

<sup>2</sup> optocoupler: 5.5 mA, LED: 5.5 mA

<sup>3</sup> 1 Hz resolution up to 300 Hz; 14 Hz resolution at 5 kHz

<sup>4</sup> 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 <sup>4</sup>	94	110	-	k $\Omega$
$f_{sample}$	internal register update frequency	-	400	-	-	Hz

<sup>4</sup> input impedance decreases, when  $V_{AIN}$  is higher than 11.2 V

**AIN supply output**

- $V_{\text{sup,AIN}} = 8 \text{ V}$
- $I_{\text{sup,AIN,max}} = 90 \text{ mA}$
- 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**

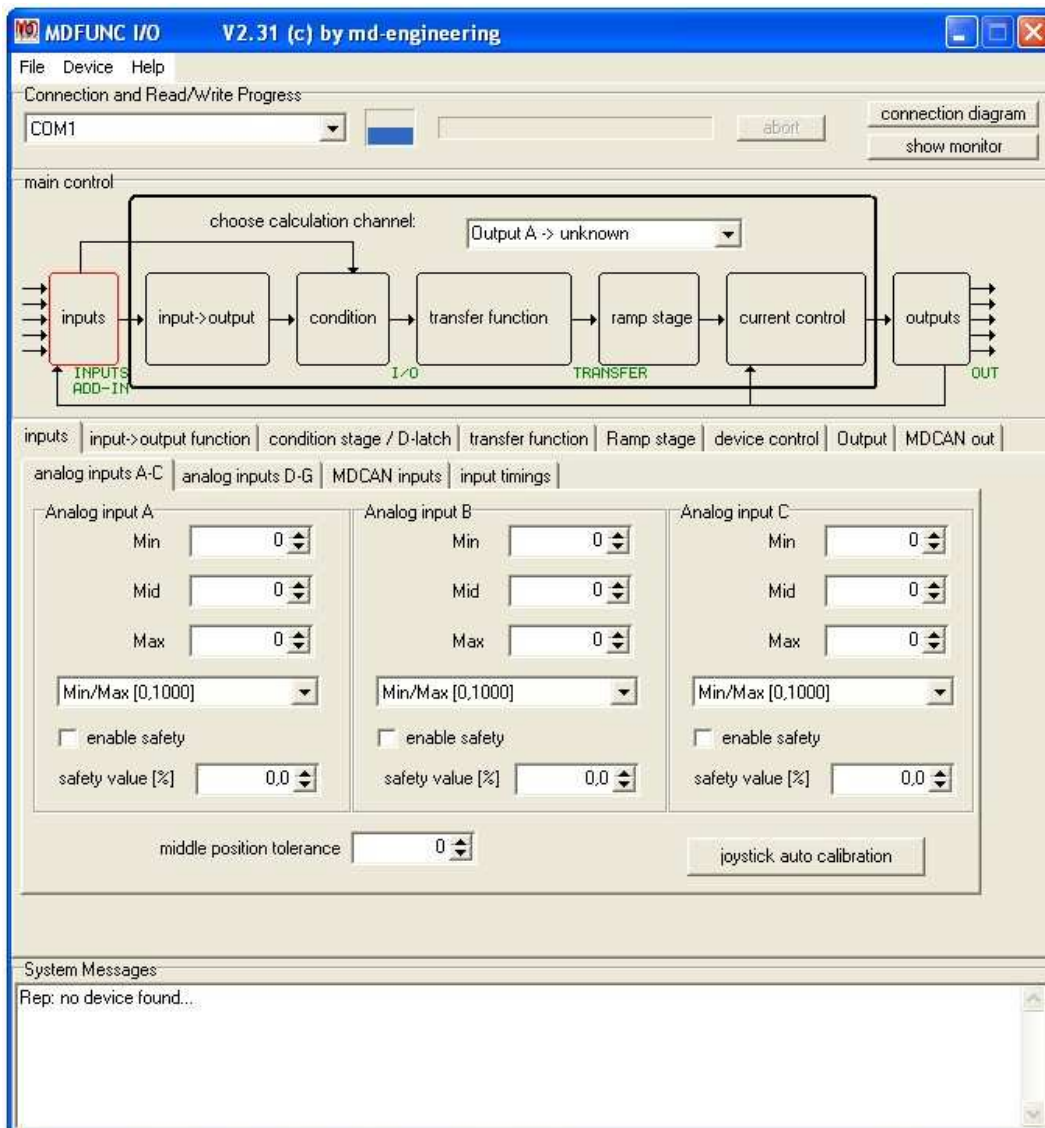
- not galvanically separated  
**ATTENTION** when using PC with grounded outlet power supply  $GND_{\text{PC}}$  must have the same potential as  $GND_{\text{PWM3}}$ .  
If the difference is more than 100 mV you can damage the Fullbridge and your PC. Best use a laptop powered by battery.
- SUB-D 9 pin 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**

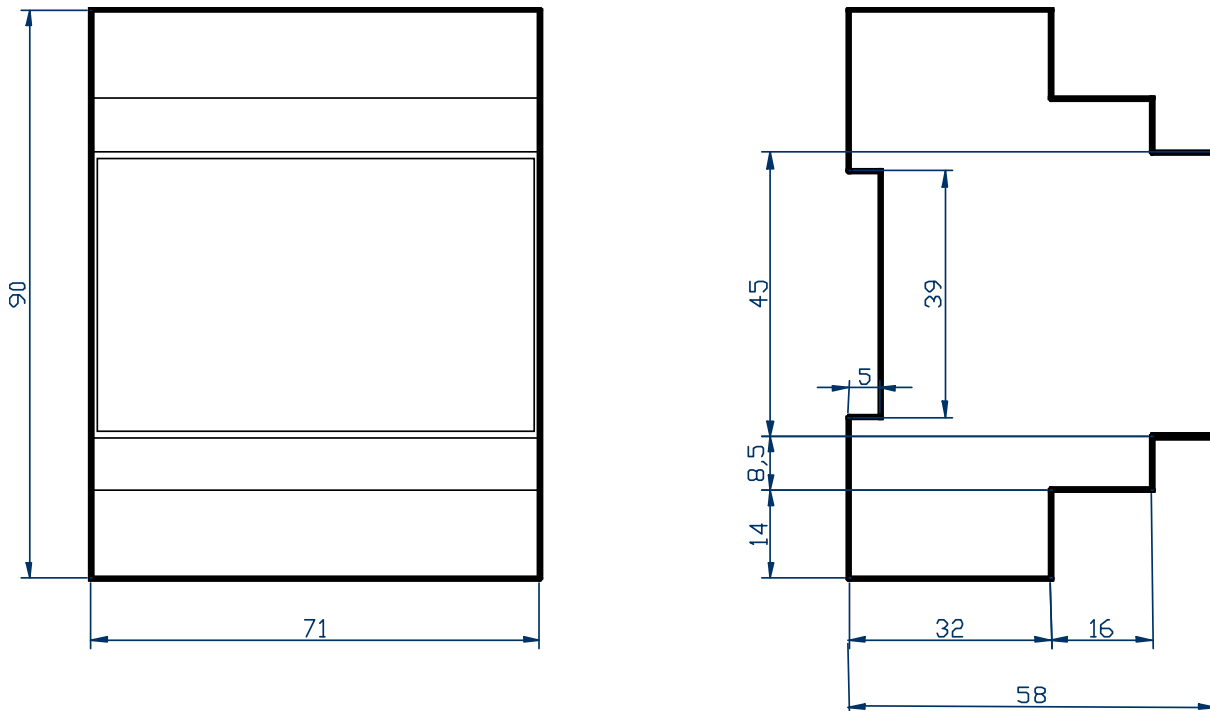
- not galvanically separated  
**ATTENTION** when using PC with grounded outlet power supply  $GND_{\text{PC}}$  must have the same potential as  $GND_{\text{PWM3}}$ .  
If the difference is more than 100 mV you can damage the Fullbridge and your PC. Best use a laptop powered by battery.
- Mini-USB connector 5 pin on board
- USB 1.1 standard
- connect Fullbridge 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

**FB with RS232 connector**  
MDFUNC-FB-RS232-LCD

**FB with USB-connector**  
MDFUNC-FB-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>