maxon motor

maxon motor control Positioning Controller MIP 100-E

Order Number: 246244

User's manual June 2004 Edition

MIP 100-E

Positioning Controller

Hardware Reference

IMPORTANT NOTICE

Since on MIP controllers the firmware resides in Flash memory you have the possibility to update the firmware of your card. The up-to-date firmware files and documentation can be found on our web site www.maxonmotor.com .

Although maxon motor endeavors to maintain a high level of compatibility with past firmware versions, some functions or features may behave differently or be missing in older version. maxon motor ag or its representatives will not endorse any liability for damages (malfunction of equipment, loss of production etc.) resulting from incompatibility of different firmware versions.

Also maxon motor ag or its representatives will not be held for responsible for damages resulting from inaccuracies or omissions in the present manual.

For specific technical questions please send an e-mail to mmc@maxonmotor.com .

Table of contents

I. Safety Instructions

Skilled Personnel

Installation and starting of the equipment shall only be performed by experienced, skilled personnel.

Statutory Regulations

The user must ensure that the motor controller and the components belonging to it are assembled and connected according to local statutory regulations.

Load Disconnected

For primary operation the motor should be free running, i.e. with the load disconnected.

Additional Safety Equipment

Electronic apparatus is basically not fail-safe. Machines and apparatus must therefore be fitted with independent monitoring and safety equipment. It must be ensured that, if the equipment breaks down, is operated incorrectly, the control unit breaks down or cables break, etc. the drive or the complete apparatus is kept in a safe operating mode.

Repairs

Repairs may only be made by authorised personnel or by the manufacturer. It is dangerous for the user to open the unit or make repairs to it.

Danger

Do ensure that during the installation no apparatus is connected to the electrical supply. After switching on, do not touch any live parts.

Max. Supply Voltage

Make sure that the supply voltage is between 24 and 48V DC. Voltage higher than 48V DC or wrong polarity will destroy the unit.

Electrostatic Sensitive Device (ESD)

Handle only at static safe workstations.

II. General information

- The **MIP100-E** eurocard is a fully **digital position, speed and current control** unit for **3-phase brushless motors** (Y or Δ-circuit) up to 500W
- The **MIP100-E** can also be used for **brush DC-motors** after **reconfiguration** of the corresponding system parameter no.7 'System Configuration'.
- The **operating system** (= firmware) of the **MIP100-E** is functionally **compatible to other MIP-systems** (i.e. the MIP100-E offers identical modes of operation and command sets).
- All PC software for other MIP-systems can still be used for the MIP100-E.
- The differences between MIP50-E and MIP100-E are the followings:

	MIP50-E	MIP100-E
Continuous power	up to 250W (5A)	up to 500W (10A)
Mosfet commutation	2 levels PWM	3 levels PWM
Connector[1]	DIN 41612 C 96 poles	DIN 41612 C 160 poles
Analog inputs[2]	2x	1x

[1] The connector of the MIP100-E is upward and downward compatible with the connector of the MIP50-E. If the MIP100-E is used in a 96 poles MIP50-E backplane, the motor current will be automatically limited (9A continuous, 12A peak).

[2] Analog input 2 is not connected on the MIP100-E.

- Please refer to the [MIP User's manual] for information about software configuration, setting of the parameter and controlling the unit.

III. Performance Data

III.1. Operating Conditions

- Operating temperature: 0 to 40°C
- Storage temperature: -25°C to 70°C
- Humidity: 10-80%, non-condensing

III.2. Supply Voltage

- Operating voltage: 24..48V DC +/- 20%
  (Ripple: max. 10% / 100Hz)
- Protection Fuse 5x20mm / T 250V 12.5A
- Braking energy: In braking mode, energy is fed back from the motor to the MIP100-E, increasing the voltage on the card (the on-board capacitors will store the energy). Take care that the voltage does not exceed 60V or the built in voltage limiting Zener diode may break down.
  If the application requires strong braking, it is necessary to add input capacitors between Power+ and Power GND or to add a braking chopper circuit to dissipate the energy (ask maxon motor) or to use a regenerative power supply.
- I/O-voltage ($V_{I/O}$): 24V DC
  (Only required, if outputs are configured as switching to $V_{I/O}$)

III.3. Power Stage

- Type: PWM power stage for 3-phase brushless motors.
  Fully digital position, velocity and current regulation, as well as current limitation
- Switching frequency: 60 kHz
- Built-in dv/dt filter chokes: 3 x 11 uH
- Built-in motor chokes: none
- External chokes

  Definitions:
  L_{mot} = terminal inductance of the motor (phase to phase)
  L_{ext} = external choke (one for each motor winding)

  48V supply:
  if $L_{mot} \geq 90\ \mu H$
  no external chokes are required
  if $L_{mot} < 90\ \mu H$
  add one external choke in series with each motor winding.

  $$L_{ext} \geq \frac{90\mu H - L_{mot}}{2}$$

  24V supply:
  if $L_{mot} \geq 35\ \mu H$
  no external chokes are required
  if $L_{mot} < 35\ \mu H$
  add one external choke in series with each motor winding.

  $$L_{ext} \geq \frac{35\mu H - L_{mot}}{2}$$

- Max. motor current: 10A continuous / 15A peak (5 sec.)/ 20A peak (200ms)
- Current meas. resolution: 45 mA
- Current limit: digitally adjustable (0..20A) + hardware limitation (32A)
- Cooling: active cooling system (by temperature-controlled fan)

III.4. Position and Current Control

- Current control: fully digital PI-regulation (8kHz)
  with digital parameter setting and autotuning facility
- Position-/Speed control: fully digital PID-regulation (1kHz)
  with digital parameter setting and autotuning facility
  Maximum speed: 1000 [qc/ms]
  Maximum speed [rpm] = 15'000'000/ encoder resolution
  but no more than 65'000 [rpm]

III.5. Inputs / Outputs

- Digital inputs:
  8 user inputs
  6 predefined inputs
  (Reference, Limit Left, Limit Right, Enable, STOP\, Reset)

  Features:
  - Inputs configurable in groups as high- or low-active
    Group 1: Reference, Limit Left, Limit Right
    Group 2: Reset, Enable, Stop\, Input 1 - Input 8
    Logic levels: High-active: 12 - 24V DC, typ. 7mA @ 24V
    Low-active: 0 - 1.5V DC, typ. 2mA

- Digital outputs:
  6 user outputs
  1 predefined output (Error)

  Features:
  - Configurable, if switching to GND (low side driver) or $V_{I/O}$ (high side driver).
    If outputs are configured as switching to $V_{I/O}$,
    $V_{I/O}$ (typ. 9 - 24V DC) has to be supplied externally.
  - Short-circuit protected
    max. 100mA/output, if switching to $V_{I/O}$
    max. 450mA totally, if switching to GND

- Analog inputs:
  1 user input (10 Bit, 0 - 5V)

- Additional outputs:
  1 user PWM-output (50kHz, TTL level, max. 2 mA)

- Hall sensor inputs:
  3 (Hall Sensor 1, Hall Sensor 2, Hall Sensor 3)
  Low active, pull-up resistor 1kΩ on board.

- Encoder input:
  RS422 (Differential, A, A\, B, B\, Index, Index\)
  maximum input frequency: 250 kHz

III.6. Serial Communication Interface

- RS 232 port:
  - ESD protected
    2400 to 57600 baud
    (may be limited in some firmware operating modes)

- RS 485 port:
  - ESD protected
  - 2400 to 57600 baud
  - Termination configurable by jumpers

IV. Mechanical Data

IV.1. Dimensions

- Eurocard 3U / 8HP
- Weight: 290g (without front panel)

IV.2. Terminal

- 160-pin connector DIN 41612 Type C:
  Ref. Harting harbus64, part number: 02 01 160 2101
  Female counterpart (backplane connector):
  Ref. Harting harbus64, part number: 02 02 160 2201
  Pin-assignment see 'V. Pin Allocation & Functionality'
  (Power, Motor, Hall Sensors, Encoder, RS232, RS485, Digital-I/O, Analog-I/O)

IV.3. Frontside Buttons and Indicators

- 'Reset' push button
- Green LED: Power
  Red LED: Error

IV.4. Peripheral Components

- Front panel (3U / 8 HP)
  Order code 200 640
- Backplane with screw terminals
  (for power, motor, encoder, Hall sensors, RS232, RS485, I/O)
  Order code 245 963
- MIP training board (order code 282 437)

  I/O and connection board for MIP10-H, MIP20-H, MIP50-E, MIP100-E.
  This board is ideal for evaluating, testing and learning with the MIP.

  The board includes following features:

  - power and motor connectors (screw terminals), hall sensors and encoder connectors
  - all inputs and outputs on screw terminals
  - switches (digital inputs) and LED (outputs), configurable as low or high active
  - potentiometers (analog inputs)
  - integrated LCD voltmeter
  - on-board RS232 to RS485 converter, easy RS485 chaining

V. Pin Allocation & Functionality

V.1. Pin Allocation Connector DIN41612 Type C 160 (Rear view)

Do not connect anything to the reserved pins !

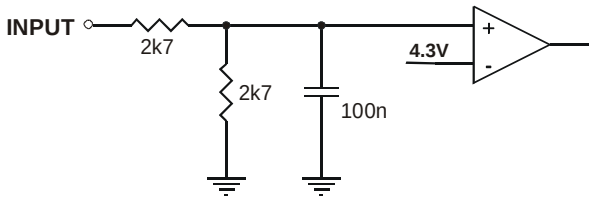
	d	c	b	a	z
1	GND_{Analog}	GND_{Analog}	n.c.	Analog Input 1	MIP100_Sense
2	V_{Ref}	V_{Ref}	V_{Ref}	V_{Ref}	n.c.
3	GND_{Analog}	GND_{Analog}	GND_{Analog}	GND_{Analog}	n.c.
4	Input: Enable	Input: Enable	Input: Stop\	Input: Reset	n.c.
5	Input: Right Limit	Input: Right Limit	Input: Left Limit	Input: Reference	n.c.
6	Digital Input 3	Digital Input 3	Digital Input 2	Digital Input 1	n.c.
7	Digital Input 6	Digital Input 6	Digital Input 5	Digital Input 4	GND
8	n.c.	n.c.	Digital Input 8	Digital Input 7	GND
9	GND	GND	GND	GND	GND
10	K-COM	K-COM	$V_{I/O}$ (typ. 24V DC)	$V_{I/O}$ (typ. 24V DC)	GND
11	GND	GND	PWM-Output	Output: Error	GND
12	Digital Output 3	Digital Output 3	Digital Output 2	Digital Output 1	GND
13	Digital Output 6	Digital Output 6	Digital Output 5	Digital Output 4	GND
14	GND	GND	$Reserved_{TDO}$	$Reserved_{TCK}$	GND
15	RS485\	RS485\	$Reserved_{TDI}$	RS485	GND
16	RS232 RxD	RS232 RxD	$Reserved_{TMS}$	RS232 TxD	GND
17	Enc. Index	Enc. Index	Enc. Channel B	Enc. Channel A	GND
18	Enc. Index\	Enc. Index\	Enc. Channel B\	Enc. Channel A\	GND
19	Hall Sensor 3	Hall Sensor 3	Hall Sensor 2	Hall Sensor 1	GND
20	V_{CC} (5V)	V_{CC} (5V)	V_{CC} (5V)	V_{Hall} (15V)	V_{Hall} (15V)
21	GND	GND	GND	GND	GND
22	Power GND	Power GND	Power GND	Power GND	Power GND
23	Power +	Power GND	Power GND	Power GND	Power +
24	Power +	Power +	Power +	Power +	Power +
25	Power +	Power +	Power +	Power +	Motor: Winding 1
26	Power GND	Power GND	Power GND	Power GND	Motor: Winding 1
27	Motor: Winding 1	Motor: Winding 1	Motor: Winding 1	Motor: Winding 1	Motor: Winding 1
28	Motor: Winding 1	Motor: Winding 1	Motor: Winding 1	Motor: Winding 1	Motor: Winding 2
29	Motor: Winding 2	Motor: Winding 2	Motor: Winding 2	Motor: Winding 2	Motor: Winding 2
30	Motor: Winding 2	Motor: Winding 2	Motor: Winding 2	Motor: Winding 2	Motor: Winding 2
31	Motor: Winding 3	Motor: Winding 3	Motor: Winding 3	Motor: Winding 3	Motor: Winding 3
32	Motor: Winding 3	Motor: Winding 3	Motor: Winding 3	Motor: Winding 3	Motor: Winding 3

V.2. Pin Functionality

❍ Analog and Digital Inputs

Pin Name	Description & Remarks
GND_{Analog}	**GND** for **analog signals** (All GNDs are connected internally).
Analog Input 1	**Analog input** for voltage in the range of 0...5V Internal 10 bits A/D-converter for measurement of analog signals.
V_{Ref}	**Reference 5V supply output.** Use only for signal generation (e.g. via potentiometer) for the analog inputs !
Input: Enable	**Digital input** for enabling the power stage. Enable acts directly on the power stage logic (hardware) but only if the monitoring of "Enable" is activated in system parameter no.7. **Not intended for safety stop !** High- or low-active configuration is done by jumpers J11 & J12.
Input: Stop	**Digital input** for switching the regulation off, if the signal **is removed**. Stop\ is only checked by the software (non-maskable interrupt) **Not intended for safety stop!** High- or low-active configuration is done by jumpers J11 & J12. System behaviour after a stop is configurable by system parameter no.7.
Input: Reset	**Digital input** for hard **reset** of the unit. High- or low-active configuration is done by jumpers J11 & J12. During **reset** the motor power stage and all digital outputs are switched off (null current).
Input: Right Limit	**Digital input** for **right limit switch** of a linear unit. High- or low-active configuration is done by jumpers J9 & J10. Monitoring of the right limit switch is configurable by system parameter no.7.
Input: Left Limit	**Digital input** for **left limit switch** of a linear unit. High- or low-active configuration is done by jumpers J9 & J10. Monitoring of the left limit switch is configurable by system parameter no.7.
Input: Reference	**Digital input** for **reference switch**. High- or low-active configuration is done by jumpers J9 & J10. The reference process can be configured by system parameters no.30-33, 38.
Digital Input 1..8	User definable **digital input**s for **process control**. High- or low-active configuration is done by jumpers J11 & J12.
MIP100_Sense	Detects MIP50 or MIP100 backplane. If this pin is tied to V_{cc}, (5V), the backplane is identified as MIP100 and the full current range can be used (10A continuous current, 20A peak). If this pin is floating or connected to GND the backplane is identified as MIP50 and the current is reduced (9A continuous, 12A peak).
GND	**GND** for **digital I/O** signals (All GNDs are connected internally).

Schematic of the digital inputs (high- or low-active logic)

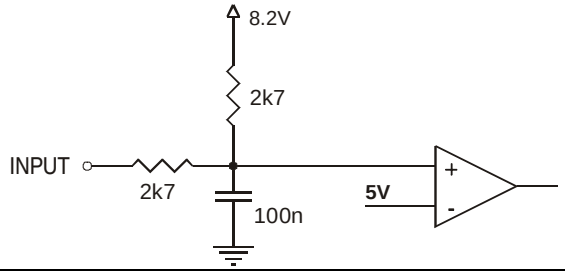


HIGH-ACTIVE LOGIC

Drive the input with a switch to 12..24 V or with a PNP (high-active) transistor output.

Warning: don't exceed 24V + 20%.

The inputs are protected against electrostatic discharges.



LOW-ACTIVE LOGIC

Drive the input with a switch to 0 V or with a NPN (low-active) transistor output.

The inputs are protected against electrostatic discharges.

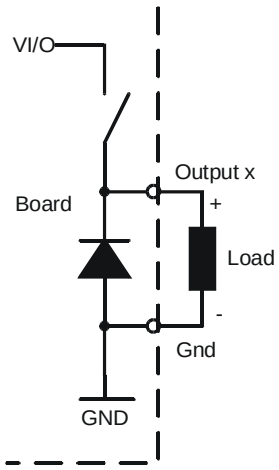
PWM and digital Outputs

Pin Name	Description & Remarks
PWM-output	User definable **PWM-output** (TTL, 0-100% duty cycle) PWM duty cycle is adjustable by user software. Independent of the PWM used for the power stage.
$V_{I/O}$	**Digital power input** (typ. 24V DC) External I/O-voltage supply is only needed if the digital outputs are configured (J2 -J8) switching to $V_{I/O}$.
Output: Error	**Digital output** of **error** signal. Automatically activated if the system is in error state. Output can be configured switching to GND or $V_{I/O}$ by jumper J8.
Digital Output 1..6	User definable **digital output**s for process control. Outputs can be configured switching to GND or $V_{I/O}$ by jumpers J7-J2. - If switching to V_S is configured, the maximum load per output is 100mA. **WARNING:** The outputs are protected by **freewheeling diodes** to ground. This means that the negative supply of the load must not be below 0V. - If switching to GND is configured, the summed load of all outputs switching to GND must not exceed 450mA. If the current exceeds 450mA, the system switches all output transistors off and generates an error messages. **WARNING:** The positive supply of the load must not exceed 35V. - If you intend to switch inductive loads to GND, connect the positive supply voltage of the load (max. 35V) to pin K-COM (K-COM = common cathode of **freewheeling diodes**). This will protect the output from voltage peaks when switching off the load.

K-COM	**Common cathode** of the **freewheeling diode** of the low side drivers. Should be connected to the load's positive voltage, if outputs are configured switching to GND (J2-J8) and inductive loads are driven. **Not connecting this pin will result in hardware damage when driving inductive loads !!**
GND	**GND** for **digital I/O** signals (All GNDs are connected internally).

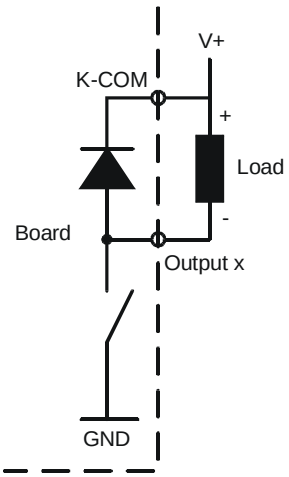
Schematic of the digital outputs (high- or low-active logic)

Warning: when driving inductive loads (e.g. relay coil) it is important that the integrated free-wheeling diodes can conduct the coil current when the output transistor is switched off or there will be voltage peak that can destroy the output transistor.



HIGH-ACTIVE (switching to $V_{I/O}$)

(-) side of the load must be connected to GND and must no be below GND.



LOW-ACTIVE (switching to GND)

K-Com Pin must be connected to the (+) side of the load (V+ max: 35V)

❍ Reserved Pins

Pin Name	Description & Remarks
Reserved	**Do not connect anything to these pins !** These pins are used for programming the digital logic components during production. If wrong voltages are connected, the components can be damaged !

❍ Communication Ports

Pin Name	Description & Remarks
RS485 **RS485**	**RS485\ and RS485 communication** lines (half-duplex, serial bus). A two-wire cable (RS485, RS485\) is sufficient to connect different MIP-systems. The MIP network can be commanded by one master system (e.g. PC). The MIP*bus*-protocol and command set has to be used for communication with the different units. The RS485 communication is only active when one the start-up modes for 'MIP*bus* -> RS485' is activated (i.e. system parameter no.2 = 5 or 9). The baudrate is configurable by system parameter no.5. ❖ maxon motor sells a convenient **RS232 to RS485 converter** for the PC COM port (Product name CV24, order code 246 398).
RS232 TxD **RS232 RxD**	**RS232 communication** lines. Connect MIP-RxD to master's TxD, MIP-TxD to master's RxD and MIP-GND to master's GND. The baudrate and data format are configurable by system parameter no.3 & 4. The standard settings are 19200 baud, 8 data bit, 1 stop bit, no parity.

❍ Encoder and Hall Sensor's Inputs and Supply

Pin Name	Description & Remarks
Enc. Index **Enc. Index**	**Input**s for the differential **index signal** of the encoder. Use only encoders with 5V differential signals according to RS422 (e.g. maxon HEDL). The index signals are not mandatory.
Enc. Channel A **Enc. Channel A** **Enc. Channel B** **Enc. Channel B**	**Input**s for the differential **signals of channel A and B** of the encoder. Use only encoders with 90° phase-shift between channel A and B, as well as 5V differential signals according to RS422 (e.g. maxon HEDL encoders). The encoder should be supplied by V_{CC} (5V) and GND provided by the MIP.
Hall Sensor 1 **Hall Sensor 2** **Hall Sensor 3**	**Input**s for the **Hall sensor** signals of a brushless motor. The Hall sensor's information is needed for the commutation of a brushless motor. If a DC brush motor is used, do not connect anything to these pins (otherwise a Hall sensor error is reported.) The type of motor used has to be configured by system parameter no.7 ! The Hall sensors have to be supplied by V_{Hall} (15V) and GND provided by the MIP. Pull-up 1kΩ to V_{CC} on board.
V_{CC}	**5V supply** (output) for **encoder**. Use only as supply voltage of the encoder !
V_{Hall}	**15V supply** (output) for **Hall sensor**s. Use only as supply voltage of the motor Hall sensors !
GND	**GND**s for **encoder** and **Hall sensors** supply. (All GNDs are connected internally).

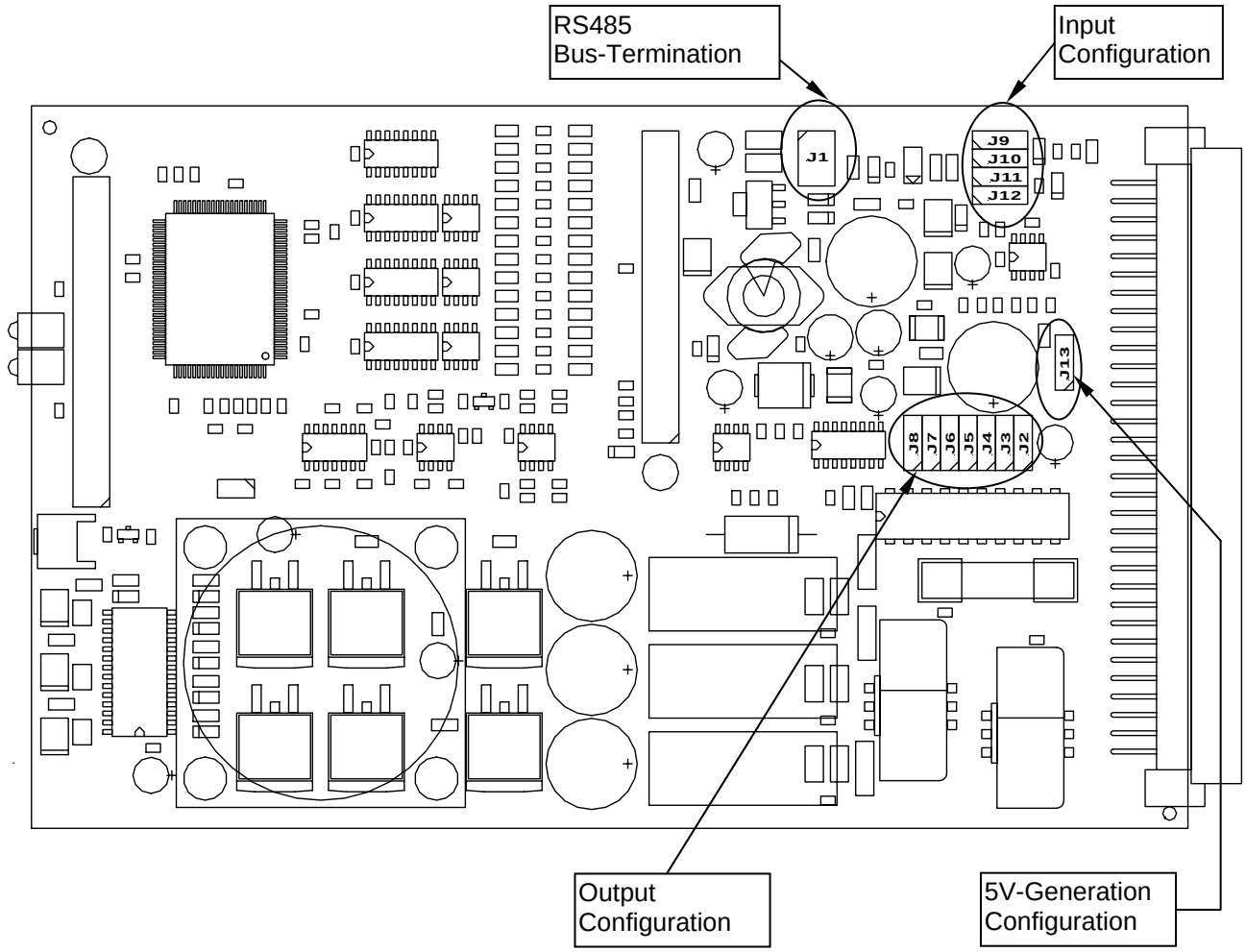
❍ Main Power Supply

Pin Name	Description & Remarks
Power GND	**GND** (input) for the main supply of the MIP100-E. All GNDs are connected internally, but the Power GNDs have thick traces for currents up to 20A. Never connect the main supply GND to standard GND or GND_{Analog}, otherwise the PCB can be damaged ! Please notice that each single pin of the DIN-connector is only capable of currents up to 1.5A, so connect the main supply GND to **all** 'Power GND' pins !
Power +	**Power** (input) (24-48V DC) for the main supply of the MIP100-E. Please notice that each single pin of the DIN-connector is only capable of currents up to 1.5A, so connect the main supply voltage to **all** 'Power+' pins ! If the digital outputs are configured switching to $V_{I/O}$, an additional I/O-voltage (typ. 24V DC) must be connected to the '$V_{I/O}$'-pins.

❍ Motor

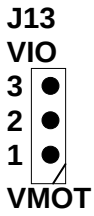
Pin Name	Description & Remarks
Motor winding 1	**Power output** for **winding 1** of a **brushless motor** or **Motor+** of a **DC brush motor**. The type of motor used has to be configured by system parameter no.7 ! Please notice that each single pin of the DIN-connector is only capable of currents up to 1.5A, so connect the motor winding to **all** corresponding pins !
Motor winding 2	**Power output** for **winding 2** of a **brushless motor** or **Motor-** of a **DC brush motor** The type of motor used has to be configured by system parameter no.7 ! Please notice that each single pin of the DIN-connector is only capable of currents up to 1.5A, so connect the motor winding to **all** corresponding pins !
Motor winding 3	**Power output** for **winding 3** of a **brushless motor**. Not used for DC brush motor ! The type of motor used has to be configured by system parameter no.7 ! Please notice that each single pin of the DIN-connector is only capable of currents up to 1.5A, so connect the motor winding to **all** corresponding pins !

VI. Components Layout and System Configuration



Electrostatic Sensitive Device (ESD)
Handle only at static safe work stations

VI.1. Configuration of 5V and 15V-Generation



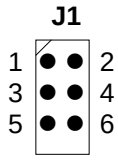
Set jumper to position ...

3 - 2	➔	if $V_{I/O}$ (24V) supply voltage is used for internal 15V and 5V generation
2 - 1	➔	if main supply voltage (POWER+) is used for internal 15V and 5V generation

Remark:

- If 5V and 15V generation by I/O-supply is configured, the 24V supply has to be connected to $V_{I/O}$ (pin 10b or 10a) and GND (pin 9b or 9a).
- If available, $V_{I/O}$ is the preferred choice for 5V and 15V generation (lower EMI, card can still communicate with host if motor power supply is switched off for a safety issue).
- The factory setting is VMOT (2 - 1)

VI.2. Configuration of RS485 Bus-Termination



Set jumper to position ...

1 - 2	➔	for bus pull-up (RS485 - 1kΩ - V_{CC})
3 - 4	➔	for bus termination (RS485 - 120Ω - RS485\)
5 - 6	➔	for bus pull-down (RS485\ - 1kΩ - GND)

Remark:

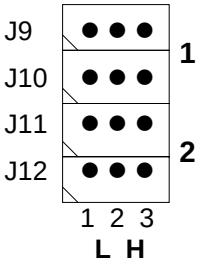
- If RS485 is not used, don't care about the jumpers.
- If a multi-axes system with RS485-communication is configured, the jumpers have to be set on the unit located at the end of the bus. For all other units the jumpers have to be removed.
- The factory setting is all jumpers off (non-terminated bus).

VI.3. Configuration of Digital Inputs Logic

The input signal lines are divided into two groups that can be configured high- or low-active.

Input group 1: Reference, Limit Left, Limit Right

Input group 2: Reset, Stop, Enable, Input 1 - Input 8



1 (J9, J10) ➔ Configure input **group 1**
(Reference, Limit Left, Limit Right)

2 (J11, J12) ➔ Configure input **group 2**
(Reset, Stop, Enable, Input 1 - Input 8)

To configure an input group as **active low** (0..1.5V / 2mA), set jumper to **position L,** i.e. connect pin 1 - 2.

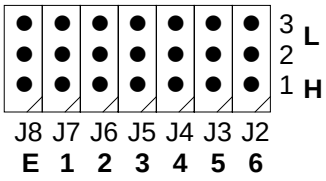
To configure an input group as **active high** (12..24V / 7mA), set jumper to **position H,** i.e. connect pin 2 - 3.

Remark:

- The jumpers of J9 and J10 have to be set to the same position.
- The jumpers of J11 and J12 have to be set to the same position.
- The factory settings are group1 & 2 configured as active high.

VI.4. Configuration of Digital Outputs Logic

Each output can be configured as switching to GND or $V_{I/O}$.



6 (J2) ➔ Configure output 6
5 (J3) ➔ Configure output 5
4 (J4) ➔ Configure output 4
3 (J5) ➔ Configure output 3
2 (J6) ➔ Configure output 2
1 (J7) ➔ Configure output 1
E (J8) ➔ Configure output „Error“

To configure an output as **switching to $V_{I/O}$**,
set jumper to **position H**, i.e. connect pin 1 - 2.

To configure an output group as **switching to GND**,
set jumper to **position L**, i.e. connect pin 2 - 3.

Remark:

- If an output is configured as switching to $V_{I/O}$, the I/O-voltage (24V) has to be connected to pins 10a or 10b of the DIN41612 connector.
- If switching to $V_{I/O}$ is configured, the maximum load per output is 100mA.

  WARNING: The outputs are protected by freewheeling diodes to ground. This means that the negative supply of the load must not be below 0V.
- If switching to GND is configured, the summed load of all outputs switching to GND must not exceed 450mA.

  WARNING: The positive supply of the load must not exceed 35V.
- If you intend to switch inductive loads to GND, connect the positive supply voltage of the load (max. 35V) to pin 10c (K-COM = common cathode of freewheeling diodes). This will protect the output from voltage peaks when switching off the load.
- The factory settings are all outputs configured as switching to $V_{I/O}$.

VII.Reconfiguration of the MIP100 for use with DC-motors

VII.1. Wiring of the Brush DC-motor

- **Wiring of the motor**

Motor terminal		MIP100
Motor +	➔	Winding 1
Motor -	➔	Winding 2

Do not connect the MIP100-E pins 'Winding 3' !

- **Wiring of the MIP100-E Hall sensors input pins**

  Do not connect any signals to **MIP100 Hall sensor inputs !**
  (If any signals are connected to the Hall sensor inputs, a Hall sensor error is reported.)

VII.2. System Settings

- **Reconfigure the system parameter no.7** for use with a DC-motor
  - In MIP-Studio press the “System Parameters” button. Under the “Drive” sheet, set the motor type to “DC”.
  - In Text Menu Mode call up the menu item '<0> - system parameters' for reconfiguration of the system parameters no.7 'System Configuration' and **set Bit 15 'Use MIP for DC-motor'** to **1**
  - Quit the system parameter menu.
    The new parameter settings are saved permanently.

- **Reboot the system**
  by switching the power supply off and on or by a reset

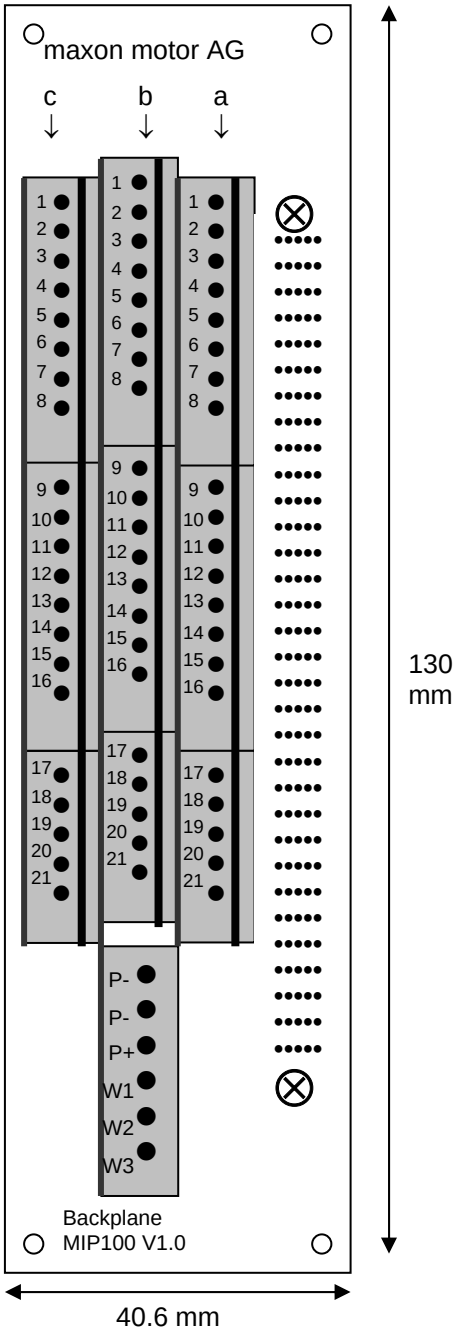
- **Adjust the system parameters of the current and position regulation,**
  depending on the motor type and the load.
  The autotuning functionality can be used therefore or the parameters can be modified directly within the system parameters menu.

VIII. Peripheral Components

VIII.1.Backplane

Order code: 245 963

c	b	a
1: n.c. 2: V_{Ref} 3: GND_{Analog} 4: Inp. Enable 5: Inp. Right 6: Dig. Inp. 3 7: Dig. Inp. 6 8: n.c.	1: n.c. 2: V_{Ref} 3: GND_{Analog} 4: Inp. Stop 5: Inp. Left 6: Dig. Inp. 2 7: Dig. Inp. 5 8: Dig. Inp. 8	1: Anal. Inp. 1 2: V_{Ref} 3: GND_{Analog} 4: Inp. Reset 5: Inp. Ref. 6: Dig. Inp. 1 7: Dig. Inp. 4 8: Dig. Inp. 7
9: GND 10: K_COM 11: GND 12: Dig. Out 3 13: Dig. Out 6 14: GND 15: RS485\ 16: RS232 RxD	9: GND 10: $V_{I/O}$ (24V) 11: PWM-Out 12: Dig. Out 2 13: Dig. Out 5 14: $Reserved_{TDO}$ 15: $Reserved_{TDI}$ 16: $Reserved_{TMS}$	9: GND 10: $V_{I/O}$ (24V) 11: Out Error 12: Dig. Out 1 13: Dig. Out 4 14: $Reserved_{TCK}$ 15: RS485 16: RS232 TxD
17: Enc. Index 18: Enc. Index\ 19: Hall Sens. 3 20: V_{CC} (5V) 21: GND	17: Enc. B 18: Enc. B\ 19: Hall Sens. 2 20: V_{CC} (5V) 21: GND	17: Enc. A 18: Enc. A\ 19: Hall Sens. 1 20: V_{Hall} (15V) 21: GND
	P-: Power GND P-: Power GND P+: Power + W1: Winding 1 W2: Winding 2 W3: Winding 3	



VIII.2.Front Panel

Order code:	200 640
Description:	Front panel with handle (incl. fixing screws)
Material:	2.5 mm aluminium, anodised
Height:	3U
Width:	8HP

Mechanical drawing: