



## Mechatronic unit MocDrive MD60-o



Picture 1 – MD60-210-o

### 1 MD60 – Description and technical data

#### 1.1 General information

#### 1.2 Technical data

Tab. 1 Technical data

Symbol	Parameter	Min	Typ	Max	Unit
U <sub>+24V</sub>	V Logic, supply voltage controller	23,5	24	24,5	V
U <sub>+48V</sub>	V Motor, Supply voltage motor	20	48	48,5	V
I <sub>Motor</sub>	Motor current			2,8	A
I <sub>OUT, Out X</sub>	Max. current of digital outputs Out0, Out1			0,1	A
U <sub>In High, In X</sub>	Threshold HIGH for inputs IN0, IN1		>14		V
U <sub>In Low, In X</sub>	Threshold LOW for inputs IN0, IN1		<10		V
U <sub>In High, RefSw X</sub>	Threshold HIGH for RefSw0, RefSw1		>3		V
U <sub>In Low, RefSw X</sub>	Threshold LOW RefSw0, RefSw1		<1,5		V
T <sub>Ambient</sub>	Ambient temperature	5	20	35	°C

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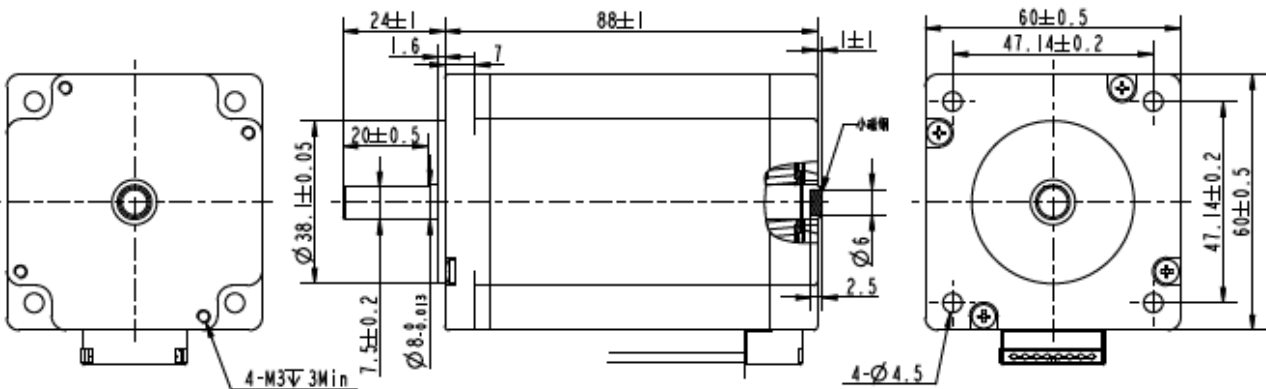
### 1.3 Motors and their dimensions

The MD60 is available with NEMA24 stepper motors (Flange 60mm x 60mm) with a holding torque of 2,1 Nm and 3,0 Nm.

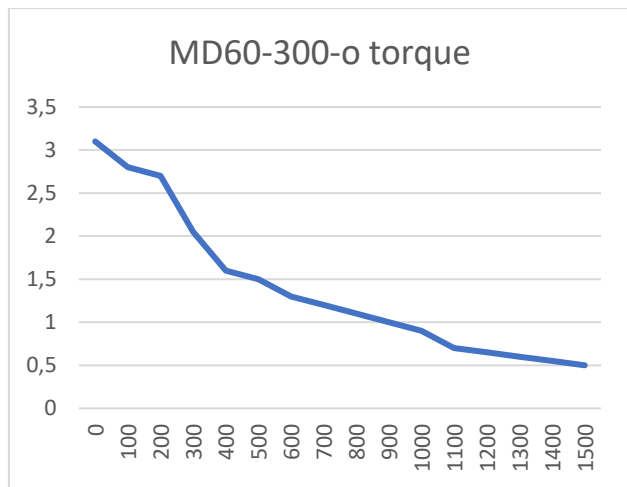
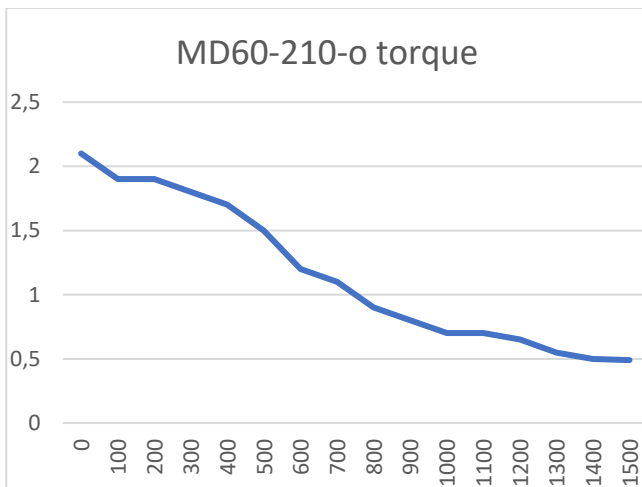
Versions with NEMA23 (57mm x 57mm) motors with different torque are available on demand too.

Following table shows the standard types:

Type	Max, holding torque	Length of the motor body
MD60-210-o	2,1 Nm	67 mm
MD60-300-o	3,0 Nm	88 mm



Drawing shows MD60-300-o as example



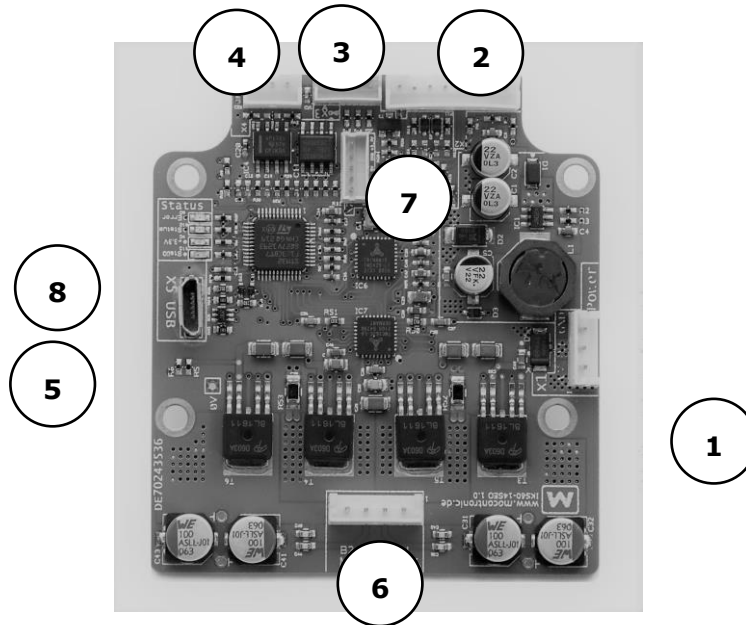
#### Torque specification Nm to rpm, motor supply 24V, 16µ steps mode

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## 2 MD60 – Connectors



Picture 2 – Overview of connectors

(1) Power (X1)	(4) RS-485 (X4)	(7) RS-232, Flash
(2) IO (X2)	(5) USB (X5)	(8) Status LEDs
(3) SWD (X3)	(6) Motor (X6)	

### 2.1 Power supply (X1)

The X1 connector is used to provide the power supply.

A EH series connector from JST is required!

	<b>Attention!</b>
	To stabilize the operating voltage and to filter out harmful voltage peaks on the supply voltage, it is urgently necessary to install an electrolytic capacitor of sufficient size (e.g. 1000µF/35V) in the supply line near the motor controller.
	Operating the controller on a supply without filtering can lead to firmware crashes or hardware damage

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Tab. 2 – Power supply (X1)

	Pin	Marking	Description
	1	+V <sub>Motor</sub>	Motor supply, +24 to +48V
	2	+V <sub>Logic</sub>	IO supply for controller, +24V
	3	GND	Ground, GND

## 2.2 Inputs, Outputs and reference switches (X2)

The connector X2 offers connectivity to the Inputs, the Outputs and the reference/stop switches. The IO supply 24V is connected to Pin 2 of X1 internally.



### Attention!

The digital outputs are not short-circuit proof.  
The digital outputs do not have a freewheeling diode.  
The digital outputs can handle a maximum load of 0.1A.

Tab. 3 - Connector (X2)

	Pin	Marking	Description
	1	Out 0	Output 0, low-side open drain switch, I <sub>max</sub> = 100mA, not short-circuit proof, no freewheeling diode for inductive loads available!
	2	Out 1	Output 1, low-side open drain switch, I <sub>max</sub> = 100mA, not short-circuit proof, no freewheeling diode for inductive loads available!
	3	In 0	Input 0, Digital or Analogue 0-10V
	4	In 1	Input 1, Digital or Analogue 0-10V
	5	RefSwL	Left limit switch, up to 24V
	6	RefSwR	Right limit switch, up to 24V
	7	+V <sub>Logic</sub>	Connected to logic supply of X1, can be used to power a sensor.
	8	0V, GND	GND, Ground

## 2.3 RS-485 (X4)

Attention! No bus termination on the board ! If you get in trouble while communicating please apply an external bus termination !

Tab. 4 – RS485 connections (X4)

	Pin	Marking	Description
	1	B/-	RS485 B. (Pin 2 if you are using D-Sub-9 connector)
	2	A/+	RS485 A. (Pin 7 if you are using D-Sub-9 connector)
	3	GND	GND, Ground

## 2.4 USB (X5)


Virtual COM-Port, Use Micro-USB cable only !

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## 2.5 Motor connector (X6)



**Warning!**

Please do not disconnect when powered up!

Tab. 5 Motor (X6)

	Pin	Marking	Description
	1	A1	A
	2	A2	/A
	3	B1	B
	4	B2	/B

## 2.6 Mocontronic Debug (X3)

Internal use only !

## 2.7 Mocontronic Flash (X7)

For production purpose only !

## 2.8 Status LED

The LEDs show the correct power supply, the status of the OS and error conditions.

In normal operation, the voltage LEDs must light up, the status LED must flash evenly and the error LED must be off.

Matching cable sets for all connections are available as an option.

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## 3 Tips and tricks

### 3.1 TMCL emulation mode

The IKS60-14SE motor controller used at the MD60 is equipped with Mocontronics' MocOS-CL which is an extension to Trinamics' TMCL™ using the same syntax.

For using own software or the TMCL-IDE the IKS60 has an emulation mode simulating to be a TCMC-1160.

For further information please refer to the MocOS-CL reference manual too.

Even in emulation mode some parameters are used another way than with the TCMC-1160. These parameters are shown in the following.

### 3.2 Motor current

The axis parameters maximum current (SAP 6) and standby current (SAP 7) are divided in 32 steps using values from 0 to 254.

Tab. - 6 – Current levels

Level	SAP 6/7		I Peak [A]	I RMS [A]
	from	to		
1	0	7	0,13	0,09
2	8	15	0,25	0,18
3	16	23	0,38	0,27
4	24	31	0,50	0,35
5	32	39	0,63	0,44
6	40	47	0,75	0,53
7	48	55	0,88	0,62
8	56	63	1,00	0,71
9	64	71	1,13	0,80
10	72	79	1,25	0,88
11	80	87	1,38	0,97
12	88	95	1,50	1,06
13	96	103	1,63	1,15
14	104	111	1,75	1,24
15	112	119	1,88	1,33
16	120	127	2,00	1,41
17	128	135	2,13	1,50
18	136	143	2,25	1,59
19	144	151	2,38	1,68
20	152	159	2,50	1,77
21	160	167	2,63	1,86
22	168	175	2,75	1,94
23	176	183	2,88	2,03
24	184	191	3,00	2,12
25	192	199	3,13	2,21
26	200	207	3,25	2,30
27	208	215	3,38	2,39
28	216	223	3,50	2,47
29	224	231	3,63	2,56
30	232	239	3,75	2,65
31	240	247	3,88	2,74
32	248	254	4,00	2,83

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### 3.3 IO functions

#### 3.3.1 GIO – Get Input, command 15

Bank	Type	Description	Range	Access
0	0..1	Digital input In0 und In1	0-1	R
0	255	Both digital inputs as pattern	0-3	R
1	0	In 0 Analogue value, 2,5002 mV/Digit	0-4096	R
1	1	In 1 Analogue value. 2,5002 mV/Digit	0-4096	R
1	2	+48V $V_{Motor}$ 0.088623 mV/Digit	0-4096	R
1	3	+3,3V $V_{Motor}$ 0.088623 mV/Digit	0-4096	R
1	8	+24V, $V_{Logic}$ , Return = Value/10 V	0-363	R
1	9	Raw CPU temperature		R
2	0..1	State of digital outputs 0 and 1	0-1	R

## 4 Revision History

### 4.1 Document revision

Tab. 7 – Document revision

Version	Datum	Autor	Beschreibung
1.0	04.09.2023	AW	German version
1.01	31.05.2024	AW	English version

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