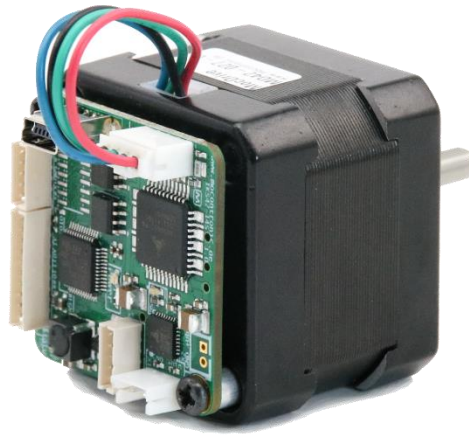




## MocDrive MD42-o MANUAL



Picture 1 – MD42-o -

### 1 MD42-o 1.0 – Description and technical data

#### 1.1 General information

This manual is valid for hardware version 1.0 and firmware version 1.10 and above.

#### 1.2 Overview

The MD42 is a mechatronic unit consisting of a NEMA17 stepper motor and an IKS42 stepper motor control. The unit can be controlled by a host or by scripts stored on the unit.

- Supply voltage 24V DC
- Motor current up to 2A RMS
- Communication by USB or RS485 as standard, Versions for RS232 or CAN available
- In- and Outputs 24V compatible
  - 1x left and 1x right reference / stop switch
  - 2x additional inputs digital
  - 1 input analogue 0...5V
  - 2 digital Outputs 24V open drain
- The MD42 is compatible to Trinamics TMCL language and can emulate a TMCM-1140 module to use TMCL-IDE. Some features are added (see software documentation)
- Also available with metal housing and M8 industrial connectors

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### 1.3 Technical data

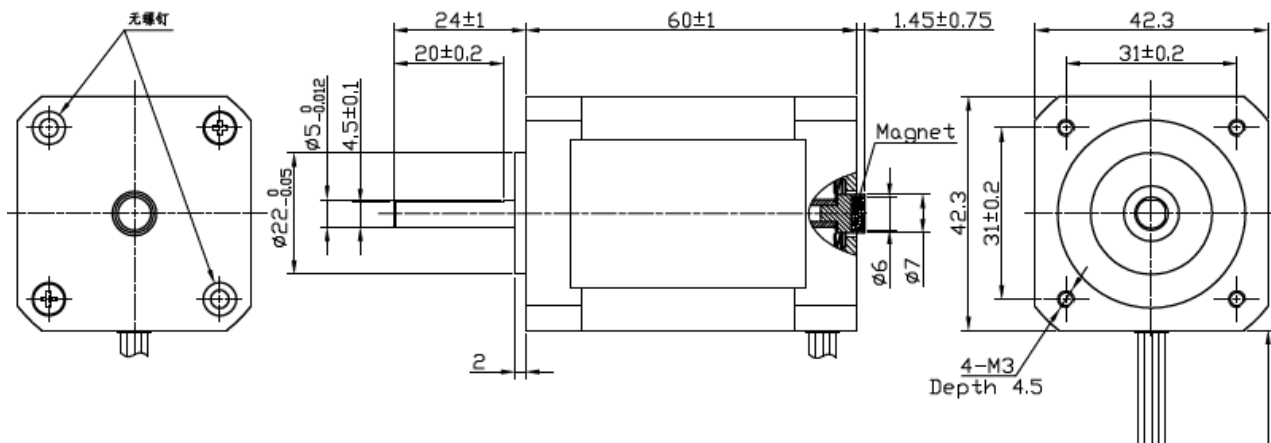
Tab 1 maximum ratings

Symbol	Parameter	Min	Typ	Max	Unit
$U_{+24V}$	V Logic, Supply voltage of control <sup>(1)</sup>	22,5	24	26,5	V
$I_{Motor}$	Motor current			2,0	A
$T_{Amb.}$			20		°C

(1) Self-protection above 26,5V and below 22,5V to avoid damages.

Tab 2 Holding torque and length of motor

Modell	Max. holding torque	Length of motor base
MD42-022-o	0,22 Nm	33,5 mm
MD42-036-0	0,36 Nm	39,5 mm
MD42-044-o	0,44 Nm	47,5 mm
MD42-077-o	0,77 Nm	60 mm



Dimension drawing of version with 0,77 Nm

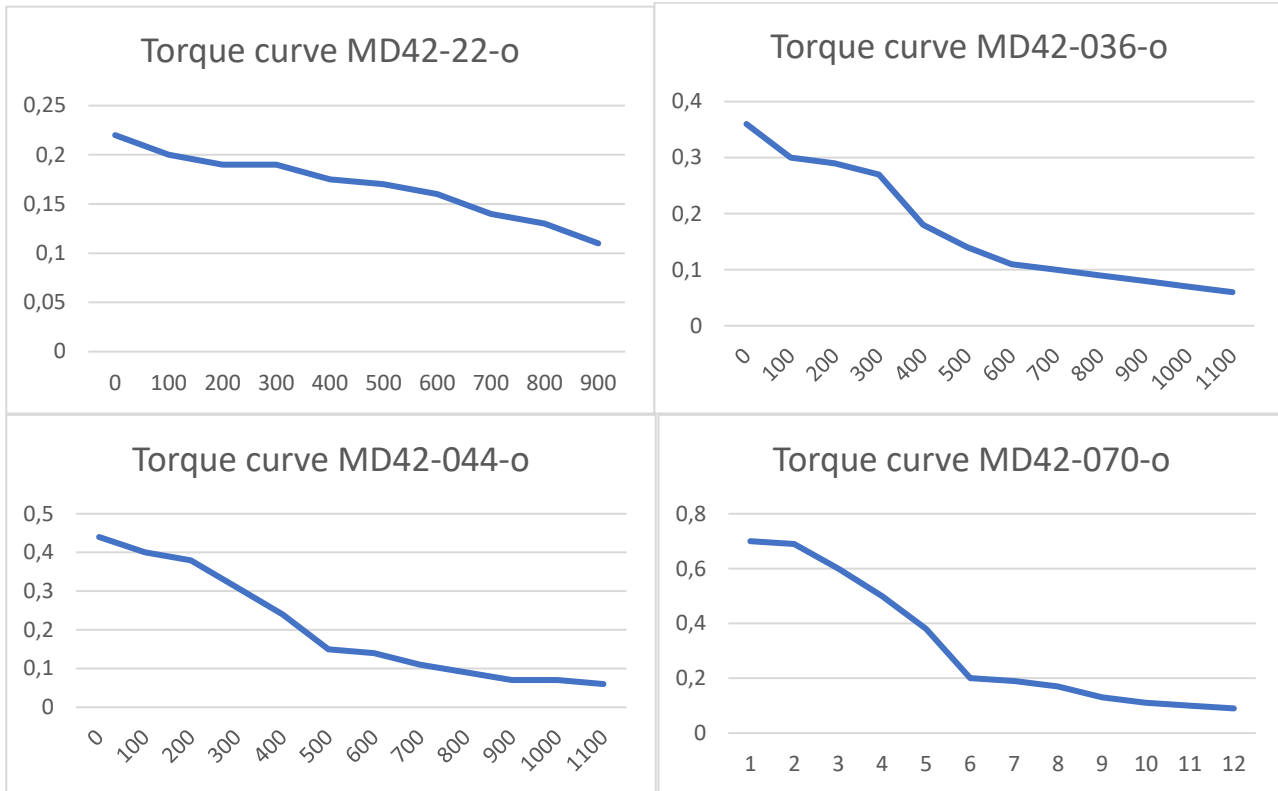
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**Torque in Nm to rpm**

**Supply voltage 24V, microsteps 16 $\mu$**

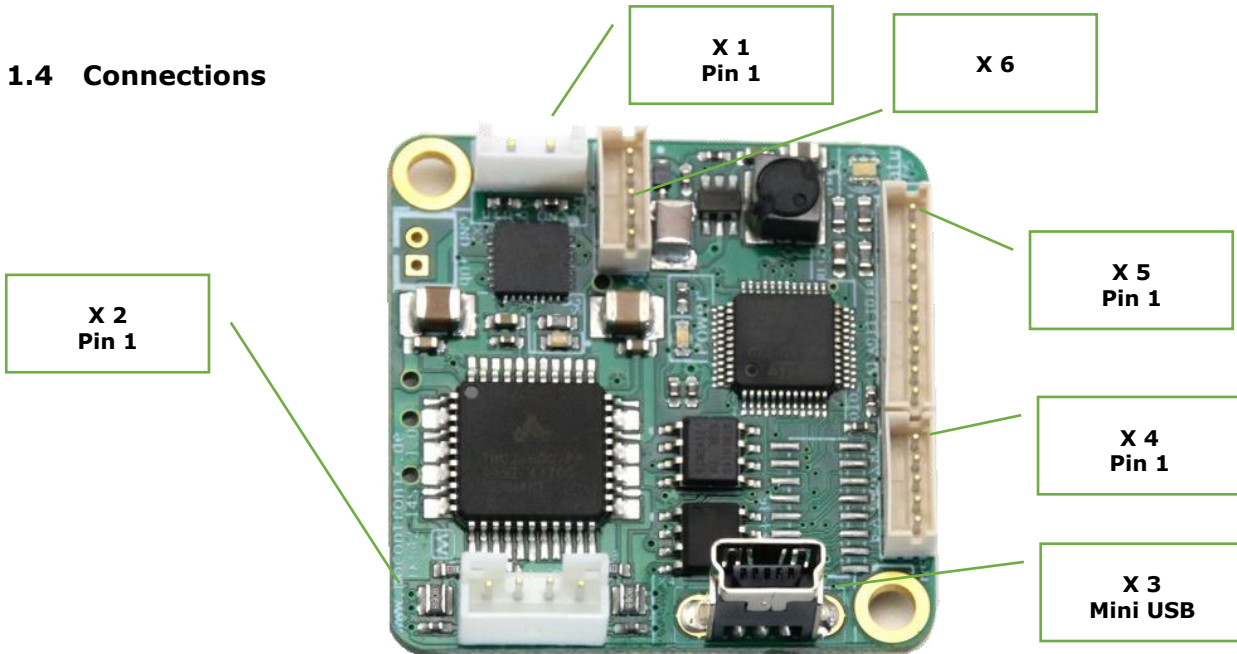


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### 1.4 Connections



Picture 2 -Overview of connections

Tab 3 - Connections

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

### 1.5 Connectors

The following table shows type of connectors used on IKS42

Tab 4 -Connectors

No.	Description	Manufacturer	Article no housing	Article no for contacts
X1	Supply voltage	JST	EHR-2	SEH-001T-P0.6
X2	Motor	JST	PHR-4	SPH-002T-P0.5S
X3	USB		USB2.0 Mini B	
X4	RS-485	JST	ZHR-5	SZH-003T-P0.5
X5	I/O	JST	ZHR-10	SZH-003T-P0.5
X6	SWD	JST	ZHR-5	SZH-003T-P0.5

You can order suitable cable looms with short cables on it as an option.

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## 1.6 Connecting the supply voltage

	<b>Attention!</b>
	To stabilize the operating voltage and to filter out harmful influences on the supply voltage, an electrolytic capacitor (e.g. 1000µF/35V) is necessary.

Tab 5 connect the supply (X1)

	Pin	Marking	Description
	1	GND	GND, Ground
	2	+24V	+24V supply voltage !! No reverse polarity protection !!

## 1.7 Stepper motor (X2)

Tab 6 connect the stepper motor (X2)

	Pin	Marking	Description
	1	OA1	A
	2	OA2	/A
	3	OB1	B
	4	OB2	/B

## 1.8 USB (X3)

Use mini USB cable only !

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## 1.9 RS-485 (X4)

External resistor for termination off the bus is necessary !!

Tab 7 Connect RS485 (X4)

	Pin	Marking	Description
	5	RS-485 B/-	B
	4	RS-485 A/-	A
	3	GND	GND, Ground
	2	RS232 TxD	(RS232 Option only)
	1	RS232 RxD	(RS232 Option only)

## 1.10 In- and Outputs (X5)

Tab 8 Connect the IOs (X5)

	Pin	Marking	Description
	1	+24V	+24V, Connected intern to X1, Pin 1
	2	0V, GND	GND, Ground
	3	RefSw L	Left limit switch, Low < 2V, High > 5V
	4	RefSw R	Right limit switch, Low < 2V, High > 5V
	5	IN0	Digital Input 0, Low < 2V, High > 5V
	6	IN1	Digital Input 1
	7	AIN0	Analogue input 0-5V
	8	N.C.	n.c.
	9	DOUT0	Digital output 0 Open Drain, $U_{MAX}=24V$ , $I_{MAX}=50mA$ , no freewheeling diode
	10	DOUT1	Digital output 1 Open Drain, $U_{MAX}=24V$ , $I_{MAX}=50mA$ , no freewheeling diode

## 1.11 Mocontronic internal (X6)

For internal purpose only !

## 1.12 Status LED

No. 7. Pulsating green -> Normal mode, Pulsating red -> error mode (e.g. low voltage)

## 1.13 Power LED

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## 2 Please note !!!

### 2.1 Emulation mode

The MD42/IKS42 is compatible with Trinamics TMCL language. For using the TMCL-IDE it emulates the TMCM-1140 module.

But there are some more features you can not use with TMCL-IDE. Please note the additions and notes below in the additional firmware manual.

### 2.2 Additional and different commands

#### 2.2.1 GIO

Tab 8 - GIO

Function	Type	Motor /Bank	Description
Read digital in	0: IN0 1: IN1 255: IN0-IN1 as pattern	0 -> Digital	Read input digital (0/1)
Read analogue values	0: Analogue input 1,8: +24V Supply 2: +3,3V Intern 3,9: CPU temp	1 -> Analog	Read inputs and interpret them analogously.  Note: • Type 0, voltage range 0-5V, value 0...4095, 1.221 mV/digit • Type 1,2,8: Value / 10 = x [V]. • Type 3.9: CPU temperature value in °C T  The inputs IN2 and IN3 are also used as reference switches!
State of outputs	0: DOU0 1: DOU1	2: Read outputs state	

#### 2.2.2 Axis parameters for IKS42s s

The simple closed-loop position control enables step losses to be corrected.

If the target position has been reached, it is checked whether the encoder value is within the position window (AP 80) around the target position. If this is the case, the position approached is assumed to be correct.

If the encoder value is outside the position window, we will try to move to the target position again with the configurable closed-loop speed (AP 81). The process is repeated until the encoder position is within the position window around the target position.

In order for the closed-loop control to function correctly, the magnetic encoder must be correctly parameterized (AP 140 – microstep resolution, AP 210 – encoder prescaler). It is also important that the basic positioning parameters (AP 4 - positioning speed, AP 5 - acceleration, AP 153 - ramp divisor, AP 154 - pulse divisor) are set correctly.

Tab 9 simple closed loop parameters

No	Parameter	Description	Range	RW
80	Closed Loop Activate	Activate the closed-loop control. 0: Disable 1: Activate	0... 1	RW

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No	Parameter	Description	Range	RW
81	Closed Loop Position Window	The position window is an area around the target position where the deviation from the target position is considered acceptable. If the encoder value is within the position window, no readjustment is carried out. However, if the encoder value is outside the position window, the position is readjusted.	0... $(2^{31}) - 1$ 0... 2.147.483.647 [microsteps]	RW
82	Closed Loop Velocity	The position is corrected at this speed if readjustment is required.	0... $(2^{31}) - 1$ 0... 2.147.483.647 [microsteps]	RW

### 2.3 Motor current

The parameter for the motor current and holding current (SAP/GAP, 6 and 7) allows values from 0-160. However, the actual current can only be set in 19 levels. An overview can be found in Table 11.



**WARNING**

- The maximum motor current is only at an ambient temperature  $T_{amb.}$  of 25°C permitted and sufficient ventilation permitted.
- At maximum motor current, the control can become very hot. There is a risk of burns!

Tab 11 – Levels for current

Level	SAP 6/7		I RMS [A]	I PEAKar [A]
	from	to		
1	0	7	0,101	0,142
2	8	15	0,201	0,285
3	16	23	0,302	0,427
4	24	31	0,403	0,570
5	32	39	0,504	0,712
6	40	47	0,604	0,855
7	48	55	0,705	0,997
8	56	63	0,806	1,140
9	64	71	0,907	1,282
10	72	79	1,007	1,425
11	80	87	1,108	1,567
12	88	95	1,209	1,710
13	96	103	1,310	1,852
14	104	111	1,410	1,994
15	112	119	1,511	2,137
16	120	127	1,612	2,279
17	128	135	1,713	2,422
18	136	143	1,813	2,564
19	144	151	1,914	2,707

## 3 Revisions

### 3.1 Document

Tab 12 – Document revisions

Version	Date	Person	Description
1.0	09.02.2022	CR	Initial version
1.01	30.09.2023	AW	German version MD
1.02	27.05.2024	AW	English version

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