



**SMART MOTOR DEVICES**

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**STEP MOTOR DRIVER  
SMD-4.2DIN**

*manual*  
**SMDDIN.42.001**



## 1. Product designation

Step motor controller SMD-4.2DIN is an electronic device designed to operate with 2 or 4-phase stepper motor with maximum current per phase up to 4.2 Amp.

## 2. Functions and possibilities

- Pulse position control with standard logic low level voltage signals 0...1VDC and high level voltage signals 4...5VDC (up to 24VDC on condition that additional current limiting resistances are used) «STEP», «DIR» and «ENABLE» is provided;
- Analog speed control is provided: using internal or external potentiometers or analog voltage signal 0..5VDC;
- Analog position control (motor shaft rotation angle) is provided: using internal or external potentiometers or analog voltage signal 0..5VDC;
- 2-sign 7-segment display is provided for indication of alarms and the driver adjustment;
- Automatic source voltage control – if the power supply falls outside the allowance range (less than 20VDC or more than 51VDC) when the driver is switched on or within 2 seconds during operation, the driver outputs the alarm and indicate the alarm code on the 2-sign 7-segment display (see the table 4);
- A motor acceleration and deceleration is adjusted;
- The driver is equipped with an internal brake resistor. External brake resistor can be connected as well if needed;
- Control of a known state of the driver and output of the relevant signal FAULT;
- Alarm sound, indication of a code of the alarm on the 2-sign 7-segment display and inversion of FAULT output signal are provided (see the table 4);
- It is possible to reset menu settings to default values;
- It is possible to reset the driver.

## 3. Technical characteristic

Table 1.

<b>Common characteristics:</b>	
Maximum output current per phase, Amp	4.2
Minimum output current per phase, Amp	0.1
Microstepping	In the current control mode: 1/1, 1/2, 1/4, 1/8, 1/16 In the voltage control mode additionally: 1/32, 1/64, 1/128
Power supply, VDC (stabilized)	24...48
Maximum overall dimensions, mm	116x100x23
<b>Inputs STEP, DIR, ENABLE</b>	
High voltage level, VDC	4...24 (24VDC on condition of using additional current limiting resistors)
Low voltage level, VDC	0...1
Input STEP resistance, kOhm, no less	3
Inputs DIR and ENABLE resistance, kOhm, no less	1
Input current of control input STEP, mA	1,4...4
Input current of control inputs DIR и ENABLE, mA	4...12
<b>Output «FAULT» parameters</b>	
Signal type	Opto-coupler output
Maximum voltage, VDC	20
Maximum load current, mA	100
Resistance at close contact, Ohm, no more	100

### Environmental Conditions:

Ambient Temperature: 0...+40°C  
Humidity: 90% RH or less upon condition +25°C  
Condensation and freezing: none  
Pressure: 650...800 mm of mercury

## 4. Construction

The driver SMD-4.2DIN is designed as a circuit plate with electronics components, indication and control elements, terminals and connectors. The plastic case of the driver is designed to be mounted on a DIN rail. The heatsink is installed inside the case on the circuit plate. There are graphical symbols of the control elements and the terminals assignment on the top part of the case.

Besides the control elements at the driver frame there are:

- connector A for a stepper motor phases connection (fig. 1);
- connector B for a power supply and external braking resistor connection (fig.1);
- connector C for connection of control signals STEP, DIR, ENABLE (fig.1);
- connector D for connection of an external potentiometer or source of analog signal 0...+5VDC – to analog speed or position control, and for connection of the output signal FAULT (fig.1);
- internal potentiometer SPEED for analog speed or position control (fig.1);
- 2-sign 7-segment display for indication of control modes, the driver state and alarm codes (fig.1);
- buttons for adjusting of a control mode MENU, UP, DOWN, start the operation START and reset the driver RESET (fig.2).

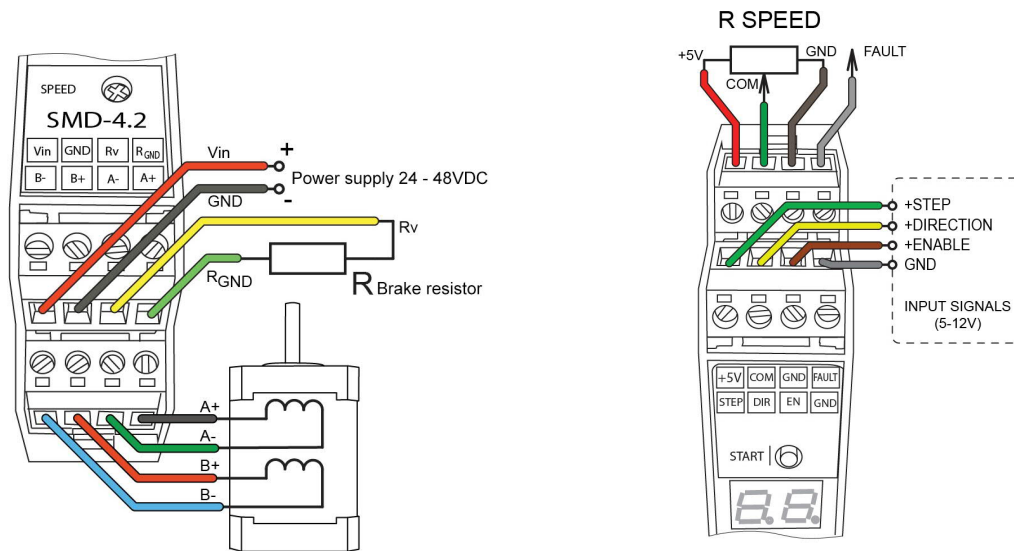


Fig. 1. Terminals of the stepmotor driver SMD-4.2DIN

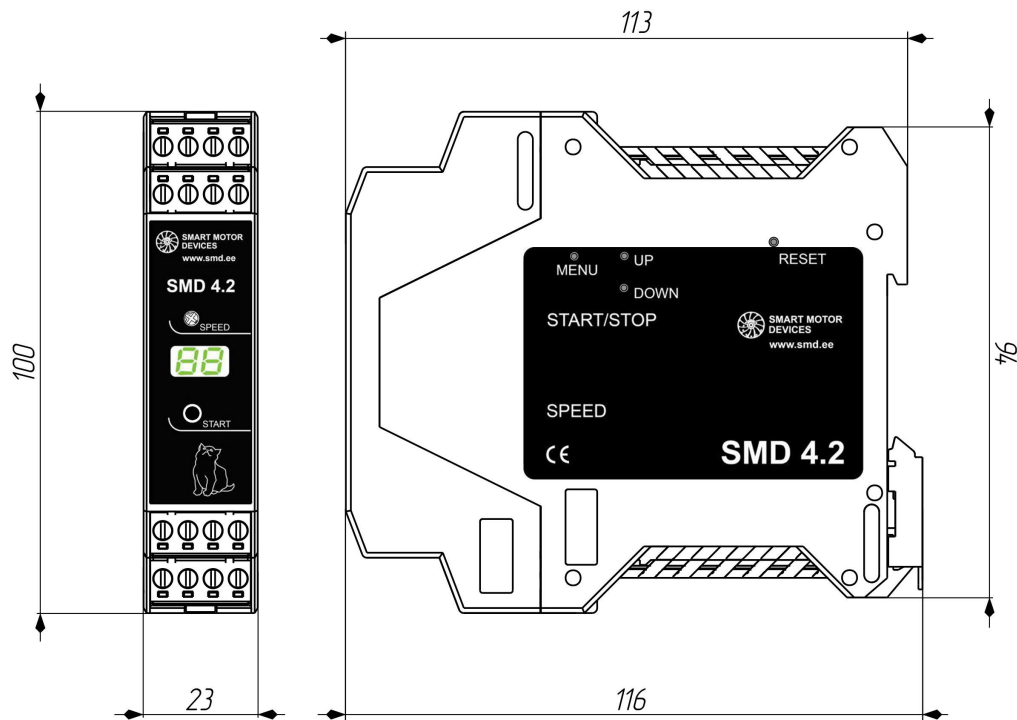


Fig. 2. The frame of the stepmotor driver SMD-4.2DIN

## 5. Connection

Please follow this manual carefully for connection and assembly.

**Please, connect wires only when power is off. Do not attempt to change wiring while the power is ON.**

Please, provide a reliable contact in connection terminals. During wiring, please, observe the polarity and wire management. Connection examples are shown on figures 3-7. Possible connection schemes for motors are given below in the table 2.



## Connection examples for control inputs and outputs of the driver:

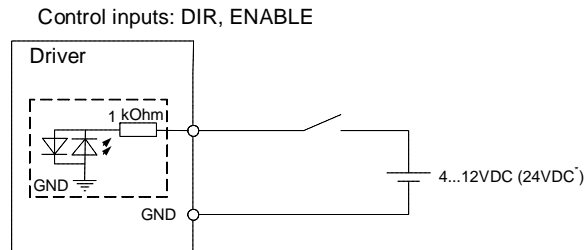


Fig.3. Connection of the input signals (4...12VDC) to an external controller.

It is possible to use the voltage 24VDC as a high level signals for inputs DIR and ENABLE on condition of using additional current limiting resistors 1kOhm.

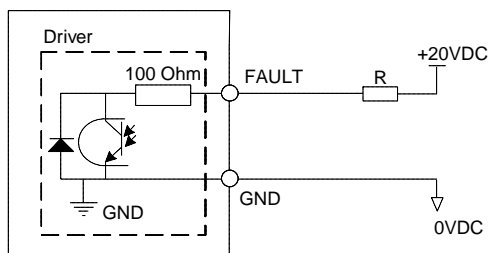


Fig.4. An example of output signal FAULT connection.  
Signal type – opto-coupler output. Max. voltage: 20VDC, max. current: 100mA

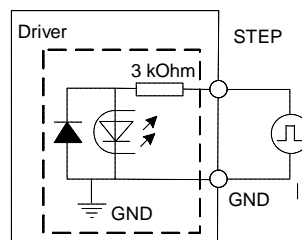


Fig.5. An example of input STEP connection, high level voltage signal 4...12VDC (24VDC). It is possible to use the voltage 24VDC as a high level signals for input STEP on condition of using additional current limiting resistors 3kOhm.

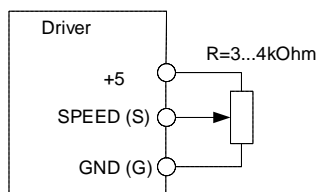


Fig.6. Analog speed control or analog position control with the use of an external potentiometer

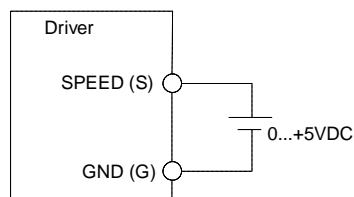


Fig.7. Analog speed control or analog position control with the use of an analog voltage signal 0...5VDC source.

## Connection of an external braking resistor

Braking (regenerative) resistor is meant to be used to absorb and dissipate energy, which appears due to deceleration or forced rotation of the motor (as an example, during deceleration of a high inertia load). The driver is equipped with an internal regenerative resistor for 5W. The power of the resistor is suitable for normal operation of a stepper motor SM8680.

In case of forced motor rotation at a speed below 120rpm (10 seconds average value at the desired interval from 0 to infinite), using of an external regenerative resistor is not necessary.

In case of forced motor rotation at a speed 120...240 rpm (10 seconds average value at the desired interval from 0 to infinite), it is necessary to connect an external brake regenerative resistor  $R=5\text{ Ohm}$   $P=100\text{W}$ . The load resistor should be connected to the screw terminals «GND» and «RES BRAKE» (fig.1).

Long duration forced motor rotation at average velocity more than 240 rpm (10 seconds average value at the desired interval from 0 to infinite) is forbidden.

## Connection of a stepper motor

The driver provides operation with 2 or 4-phase stepper motors, 4, 6 or 8 wires. Winding connection examples are in the table 2. Connect stepper motor wires to A+, A-, B+ and B- terminals of the driver according to the table 2.



Table 2.

<p>Scheme 1</p>	<p>Scheme 2</p>	<p>Scheme 3</p>	<p>Scheme 4</p>
<p>8 wires stepmotor connection (4 phases):          Scheme 1 – serial connection;          Scheme 2 – parallel connection.</p> <p>6 wires stepmotor connection (2 phases with midpoint taps):          Scheme 3;</p> <p>4 wires stepmotor connection (2 phases without midpoint taps):          Scheme 4.</p>			

### Connection and assembling

Assembling order is as below:

1. Connect the driver to a stepper motor and power supply according to the given schemes and recommendations;
2. If necessary, connect an external regenerative resistor.

## 6. Driver menu

For the purposes of the driver adjusting the special menu is used (buttons MENU, UP and DOWN and 2-sign 7-segment display).

### 6.1. Usage of the driver menu

To enter menu press and hold the button MENU till a sound signal (values at the display should start to blink). To change the menu item shortly press the button MENU again (menu switching is cyclic). To exit the menu press and hold the button MENU till a sound signal (values at the display should stop blinking). To change the parameter of a menu item, use the buttons UP (to increase the value) and DOWN (to decrease the value).

Factory reset to default parameters – simultaneous pushing and holding of UP and DOWN buttons longer than 8 sec till a sound signal. To reset the driver SMD-4.2DIN state press the button RESET (fig.2).

### 6.2. Menu items are the next:

P0 – operational control mode: Sd – pulse position control mode, A0 – analog speed control, A1 – analog position control

P1 – select a motor control mode: Cu – current mode, Un – voltage mode

P2 – select a motor type for the voltage motor control mode: 1..38 according to the table 3.

P3 – select microstepping mode: 1..16 – for current motor control mode, 1..128 for voltage motor control mode

P4 – select operating current for current motor control mode: 0.1 – 4.2A

P5 – select holding current – as a percentage of an operating current: 25%, 50%, 75%, 99%

P6 – select acceleration rate for analog speed control mode: 0..15

P7 – select deceleration rate for analog speed control mode: 0..15

P8 – turn on/turn off sound signals: ON/OFF

P9 – select display brightness: L0..L7

PA – setting of the ENABLE input inverting for the driver control mode Sd.

Important: If the inversion of ENABE input is turned on, the driver menu access is possible just in case the ENABLE signal is set.

### 6.3. Stepper motors list and numbers for the voltage motor control mode (menu item P2, P1 = Un):

Table 3.

No	Max. current per phase, Amp	Resistance per phase, Ohm	Inductance per phase, mH	Step angle	Motor model
1	1.33	2.1	2.5	1.8	
2	1.33	2.1	4.2	0.9	
3	1.2	3.3	3.4	0.9	
4	1.68	1.65	3.2	1.8	
5	1.68	1.64	3.2	0.9	
6	1.2	3.3	2.8	0.8	
7	1.68	1.65	2.8	1.8	SM4247
8	1.68	1.65	4.1	0.9	
9	1.2	6	7	1.8	
10	1.2	12.1	36.7	0.9	
11	1.56	1.8	3.6	1.8	
12	1.0	16.7	46.5	1.8	
13	1.5	3.6	6	1.8	
14	1.0	5.7	5.4	1.8	
15	1.0	5.7	8	0.9	
16	2.8	0.7	1.4	1.8	



17	2.8	0.7	2.2	0.9	
18	1.0	6.6	8.6	1.8	
19	2.8	0.83	2.2	1.8	
20	2.8	0.9	3.7	0.9	
21	1.0	7.4	10	1.8	
22	2.0	1.8	2.5	1.8	
23	2.8	0.9	2.5	1.8	
24	1.0	8.6	14	1.8	
25	2.8	1.13	3.6	1.8	SM5776
26	2.8	1.13	5.6	0.9	
27	2.0	1.2	4.6	1.8	
28	2.0	4.8	18.4	1.8	
29	2.0	1.5	6.8	1.8	
30	2.0	6	7.2	1.8	
31	2.8	0.7	3.9	1.8	
32	2.8	2.8	15.6	1.8	
33	4.2	0.375	3.4	1.8	SM8680 Parallel connection
34	4.2	1.5	13.6	1.8	SM8680 Serial connection
35	4.2	0.45	6	1.8	
36	4.2	1.8	24	1.8	
37	-	-	-	-	-
38	4.2	0.625	8	1.8	

## 7. Operation order

1. Make sure the power supply is turned off.
2. Make assembly and connection according to section 5.
3. Set controller operation parameters: motor control mode (current or voltage), operation current (for current control mode) or motor model (for voltage control mode), holding current, microstepping mode and other necessary parameters (please, refer to the section 6).

**Current control mode** – during the motor control the target parameter is a maximum operation current given to a motor phase. If use this control mode, it is possible to connect any motor to the controller under the condition of a correct current setting (use the menu of the controller) in an available range 0.1 – 4.2A. The current motor control mode performs better torque and high rotation speed, but it is limited with a maximum microstepping division 1/16;

**Voltage control mode** – performs smooth motion and provides microstepping division up to 1/128. However, rotation speed and torque are less in comparison with the current control mode. This control mode is only applicable to the exact list of motor models. The models list resides in the controller memory (please, refer to the section 6.3).

In case of control through Ethernet or via USB interface, the parameters can be adjusted by command using the controller communication interface. Otherwise use the controller menu to adjust the parameters.

### The parameters adjusting using the controller menu

- Chose the driver control mode in menu P0: **Sd** - pulse position control mode, **A0** – analog speed control, **A1** – analog position control.
- Chose the motor control mode – voltage or current. Enter the menu P1, use buttons UP and DOWN to select chosen control mode: Cu – current, Un – voltage.
- In case of voltage control mode (P1=Un), enter the menu P2 and select the motor model. List of motor models can be found in the section 6.3.
- In case of current control mode (P1=Cu), enter the menu P4 and select the maximum operation current of the connected motor (please, refer to the motor documentation).
- Enter the menu P3 and select required microstepping mode (1..1/16 for current control mode or 1..1/128 for voltage control mode).
- Enter the menu P5 and select required holding current – as a percentage of the operation current: 25%, 50%, 75%, 99%.
- Set suitable values of a motor acceleration and deceleration – enter menu P6 and P7 accordingly.

- **If used pulse position control mode Sd**, give a sequence of signals «STEP» (pulse), «DIR» (level) and «ENABLE».

High level of the signals – 4..5VDC (24VDC\*), low level - 0..1VDC.

One step (or microstep) executes as front edge of the voltage pulse on the «STEP» input. Direction switches by changing voltage level on the «DIR» input. The motion is enabled if the signal to «ENABLE» input is given. The signals oscillogram is shown on fig.8.

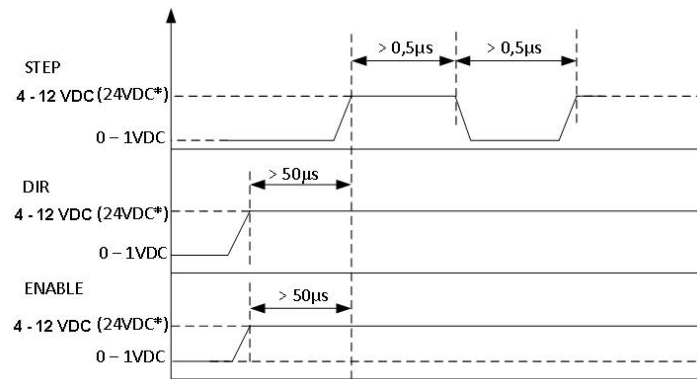


Fig.8. «STEP», «DIR» and «ENABLE» signals order and duration

\*\*Please, connect additional current limiting resistance if use high level signal +24VDC instead of 5VDC: 3KOhm for STEP input, 1KOhm for all the rest inputs.

- **If used analog speed control (P0=A0)** – control the motor velocity using the internal potentiometer SPEED, an external potentiometer (connected to inputs "+5", "S" and "G" of the connector D on the figure 1) or source of analog signal 0 – 5VDC (connect according the scheme on the figure 7). The motor motion can be started and stopped by pressing the START/STOP button, or by signal at the ENABLE input. When use an external potentiometer, the internal potentiometer SPEED should be turned to the position "0".
- **If used analog position control (P0=A1)** – control the motor rotation angle using the internal potentiometer SPEED, an external potentiometer (connected to inputs "+5", "S" and "G" of the connector D on the figure 1) or source of analog signal 0 – 5VDC (connect according the scheme on the figure 7). The motor motion can be started and stopped by pressing the START/STOP button, or by signal at the ENABLE input. When use an external potentiometer, the internal potentiometer SPEED should be turned to the position "0". In this operation mode microstepping below 1/16 is not applicable. Microstepping mode 1/16...1/128 should be used (menu item P3). In case of microstepping ratio 1/16 for a stepper motor with step angle 1.8° - the maximum rotation angle is 270°; in case of microstepping ratio 1/32 – 135°; 1/64 – 67,5°; 1/128 – 33,7°. The maximum momentary target speed is 600 steps/sec.

Designation of the control inputs, which are used in the mentioned operation modes, are given in the section 4 «Construction». Signal inputs are activated by the high voltage level. The motor rotation direction depends on a signal level on the input DIR. During normal operation the output FAULT is short to GND (fig. 4). In case of alarm situation this circuit is open. An emergency stop of the motor is performed by signal 0..1VDC at the ENABLE input, or 4...12VDC in case of inverting the signal in the driver menu PA.

The table of error codes of SMD-4.2DIN

Table 4.

Error code	Meaning
E1	Error of the stepper motor control circuits
E2	Error of the ROM
E3	Power supply of the driver is out of the permissible range
E4	The stepper motor control circuits is overheated
E5	The braking system is overheated
E6	Error of the stepmotor control
E7	Gate driver supply voltage is below the preset threshold
E8	The motor stop

## 8. Delivery in complete sets

Steppmotor driver SMD-4.2DIN  
Manual SMDDIN.42.001

1 pcs  
1 pcs

## 9. Warranty

**Any repair or modifications are performed by the manufacturer or an authorized company.**

The manufacturer guarantees the failure-free operation of the controller for 12 months since date of sale when the operation conditions are satisfied.

The manufacturer sales department address:  
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