SMC124
User Manual

Stepper motor driver

0,5 – 3,6 A   Step resolution 1/2 - 1/128

Contains

Thank you for selecting our product!

This instruction will help you at correct service and accurate exploitation of described device.

Information included in this instruction were prepared with high attention by our specialists and is description of the product. Based on the information should not be inferred a certain features or suitability for a particular application. This information does not release the user from the obligation of own judgment and verification. P.P.H. WObit E.K.J. Ober s.c. reserves the right to make changes without prior notice.

- Please read instructions below carefully and adhere to its recommendation
- Please pay special attention to the following characters:

CAUTION!
Not adhere to instruction can cause damage or impede the use of hardware or software.

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1.   Safety and assembly rules

1.1   Safety rules

- Prior to first start-up of the device carefully read the manual.
- Prior to first start-up of the device make sure all cables are properly connected.
- Provide appropriate working conditions, in compliance with the device specifications (e.g.: power supply voltage, temperature, maximum current consumption).
- Prior to any modifications of cables connections, disconnect power supply voltage.
- Driver can achieve high temperatures at longer operation and full load; hot housing can cause burn!

1.2   Assembly recommendation

It is recommended to use the following means preventing against possible interruptions of the device operation:

1. To **minimize noises**, cable which connect motor with driver should be shielded or twisted in pairs (separate twisted pair for A and B phase). It is also recommended to use a **ferrite ring** on motor cable at controller.
2. Signal cables **(CLK, DIR, EN) should** be move away from power supply line and motor wires and should be possibly short.
3. Setting **too high current** for weaker motor cause its asynchronous operation, especially at set higher step division (motor coils saturation). In longer period of time it cause stronger heating of the motor, and in consequence it leads to its damage.
4. At operations with high currents please provide its proper cooling. It is recommended to not Mount the driver in control cabinet without additional air circulation.

⚠️ **CAUTION!**
During driver operation with higher currents (>3A) it can achieve higher temperatures. To provide its proper operation please provide proper cooling by forced air circulation. Driver operations in closed control cabinet without forced air circulation can cause its overheating and turning off.
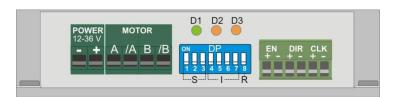
2. Device description

2.1 Device designation

SMC124 is designed for operation with two phase stepper motor with bipolar winding (4-wires) or unipolar (6 or 8-wires) used as bipolar. It allows control with step resolution in range 1/2 up to 1/128 forcing constant current value in winding independently of voltage supply value.

Features of SMC124:
- Driver voltage supply 12…36 VDC.
- Regulated current of motor winding **0,5…3,6A**
- Step resolution: 1/2, 1/8, 1/10, 1/16, 1/20, 1/32, 1/64, 1/128
- Automated current reduction
- Opt insulated inputs
- Diodes signalizing driver operations status
- Overload and thermal protection
- Small dimensions
- Housing adapted for mounting on DIN rail

2.2 Description of connectors and signalizing indicators

Picture. 1 Description of connectors and indicators of SMC124 driver.

No	Description
	Inputs
POWER	Power supply input **12…36 VDC**
MOTOR	Output for connection of stepper motor phases
EN	Enable input
DIR	Direction input
CLK	Clock input
	Signalizing diodes
D1	Signalization of driver power supply
D2	Signalization of active ENABLE input (enable for operation)
D3	Signalization of active DIR input (change of operation direction)
DP – configuration switch	

2.3 Power supply

For supplying the driver it is recommended to use a non stabilized power supply unit (PSU) with output voltage in range **+12…+36V**. PSU must receive motor return energy which provides output capacitors with capacity at least 4700µF.

Minimal current efficiency of supply source should be selected according to relationship below:

$$Izas = 12/Uzas*Ister$$

where, **Izas** – minimal current efficiency of power supply**, Uzas** – voltage supply, **Ister** – set current of the driver.

Exemplary values of current efficiencies of used power supply:

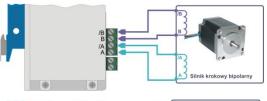| Motor current [A] Power supply [V]	1	2	3
12	1A	2A	3A
24	0,5A	1A	2A
36	0,4A	0,8A	1,5A

⚠️ **CAUTION!**
Reverse polarity or exceeding maximal voltage supply can cause damage of the driver.

During operation with high voltage supply and large motor which operates dynamically (rapid decreasing of its velocity), too small output capacitors or lack of them can damage the driver or cause its incorrect operation.
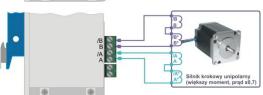
2.4   Connection of the driver

Motor should be connect to the driver using 4-wire cable. To minimize noises it is recommended to use twisted pair cable (A with /A, B with /B), for the best shielded. In case of unipolar motors (with 6 or 8 derivations) connection can be made serial or parallel.
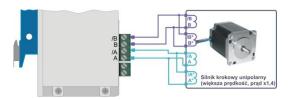
Connection of 4 –wire motor
Example of connection of bipolar stepper motor

Serial connection of 8(6)-wires motor
- Coiling connected serially to achieve higher maximal torque of the motor decreasing of its dynamics.

Parallel connection of 8-wires motor
- Coiling connected parallels to achieve higher maximal motor velocity and better operational dynamics

Increased maximal current/phase in relation to rated current **x1,4** (for example motor with current 2A, can be operated with max. current 2,8A).

⚠️ **CAUTION!**
Do not disconnect motor from the driver during its operation. It can cause damage of the driver.

2.5   Controlling inputs

All controlling inputs (CLK, DIR, ENABLE) are opt insulated. It operates with 5V (high state 3..6V). To control from voltage level 24 V into a row with controlling signals insert resistors with value 1,5..2,2k.

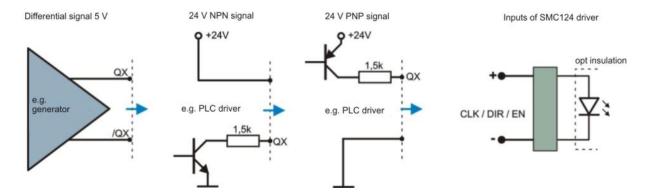Controlling signals should be connected according to scheme below:
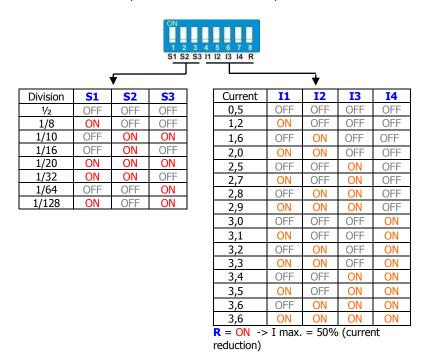
Table of driver operations states

State / Input	ENABLE	DIR	CLK
Turned off drive (motor don't hold the torque)	OFF	X	X
Turned on drive (motor hold the torque)	ON	X	OFF / ON
Motor rotations „*right"	ON	OFF	⊓⊔
Motor rotations „*left"	ON	ON	⊓⊔

ON –active input;   X – not important;   * directions taken conventionally

2.6   Description of configuration switches

Configuration of the driver is made by 1-8 switches on driver panel:

Division	S1	S2	S3
½	OFF	OFF	OFF
1/8	ON	OFF	OFF
1/10	OFF	ON	ON
1/16	OFF	ON	OFF
1/20	ON	ON	ON
1/32	ON	ON	OFF
1/64	OFF	OFF	ON
1/128	ON	OFF	ON

Current	I1	I2	I3	I4
0,5	OFF	OFF	OFF	OFF
1,2	ON	OFF	OFF	OFF
1,6	OFF	ON	OFF	OFF
2,0	ON	ON	OFF	OFF
2,5	OFF	OFF	ON	OFF
2,7	ON	OFF	ON	OFF
2,8	OFF	ON	ON	OFF
2,9	ON	ON	ON	OFF
3,0	OFF	OFF	OFF	ON
3,1	ON	OFF	OFF	ON
3,2	OFF	ON	OFF	ON
3,3	ON	ON	OFF	ON
3,4	OFF	OFF	ON	ON
3,5	ON	OFF	ON	ON
3,6	OFF	ON	ON	ON
3,6	ON	ON	ON	ON

R = ON -> I max. = 50% (current reduction)

Current reduction (R): After activation of reduction current will be reduced by about 50%, when CLK signal frequency on CLK input is lower than <1,5 Hz.

2.7   Thermal and overload protection

Occurring of current or voltage overload cause turning off of the drive. Its restart is possible after reset of power supply.

Driver overheating (exceeding of allowable temperature) cause turning off of the drive. Driver will be restart after limiting temperature of the driver.

3. Technical parameters

Description	Parameter
Power supply	12 … 36 VDC,
Motor phase current	0,5…3,6A
Step resolution	1/2, 1/8, 1/10, 1/16, 1/20, 1/32, 1/64, 1/128
Controlling signals CLK,DIR,EN	Low state: <2V, high state 5V
CLK controlling signal	Max. frequency 200khz Pulse width min. 5 µs
Environment temperature range	0°C…+30°C
Operating temperature range	0°C…+80°C
Housing	Dimensions: 60 x 110 x 21 mm Degree of protection: IP40 Mounting: handle for DIN rail