

SMC139 Manual



Microstep, highvoltage
Stepper motor driver



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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.



1.Safety and assembly rules

1.1.Safety rules

- Prior to first start-up of the device please refer to this manual;
- Prior to first start-up of the device please make sure all cables are correctly connected,
- Provide appropriate working conditions, in compliance with the device specifications (e.g.: power supply voltage, temperature, maximum current consumption).
- Before making any modifications to wiring connections, disconnect the power supply voltage.

1.2 Assembly recommendation

In the environments of unknown levels of interruptions 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 for min. 10cm.
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. Driver should be mounted in upright position to provide proper air circulation.
5. At operations with high currents you should provide cooling of the driver. To do that it is not recommended to mount the driver in closed control cabinet without additional air circulation. Do not cover the ventilator, and do not block it. Temperature of the driver can rise at long operation and at maximum load.



2. General characteristic

SMC139 is microstep, highvoltage stepper motor driver, designed for driving motors with phase currents of up to 8.2A/phase. It has 8 current settings from range 3 to 8.2 A and 6 microstep resolutions. The advantage of using microstep driver instead conventional (full step driver) is that mechanical resonance problems are significantly minimized. Resonance most often occurs at slow motor speeds and results in loss of motor torque or lost of synchronization. Microstep technique is based on driving motor using a sinusoidal current instead of rectangular. In interval between two physical steps, driver set out appropriate amount (depended of microstep resolution settings) microsteps, thanks which possible is sinusoidal current driving.

SMC139 is build into black aluminum housing with cooler. Driver can be mount on mounting rail. Separable connectors for supply, motor and controls lets quickly mount and demount driver without need of unscrew wires.

Power stages in SMC139 works with chopper frequency of 25 kHz. Mixed decay current mode allows save power and assure optimal shape of current waveform. TMC239 controller contains non-linear D/A converters which lets to gain microstep resolution 1/16. It also has precise current control mechanism which protect bridge transistors.

IMPORTANT!

This driver is sold as a motion control component to be installed in a complete system using a good engineering practice. Care must be taken to ensure that the product is installed and used in a safe manner according to local safety laws and regulations. User conform for machine conformity with EMC directive (wires length, appropriate wires leading, ferrite rings).The product must be enclosed such that no part is accessible while power may be applied.

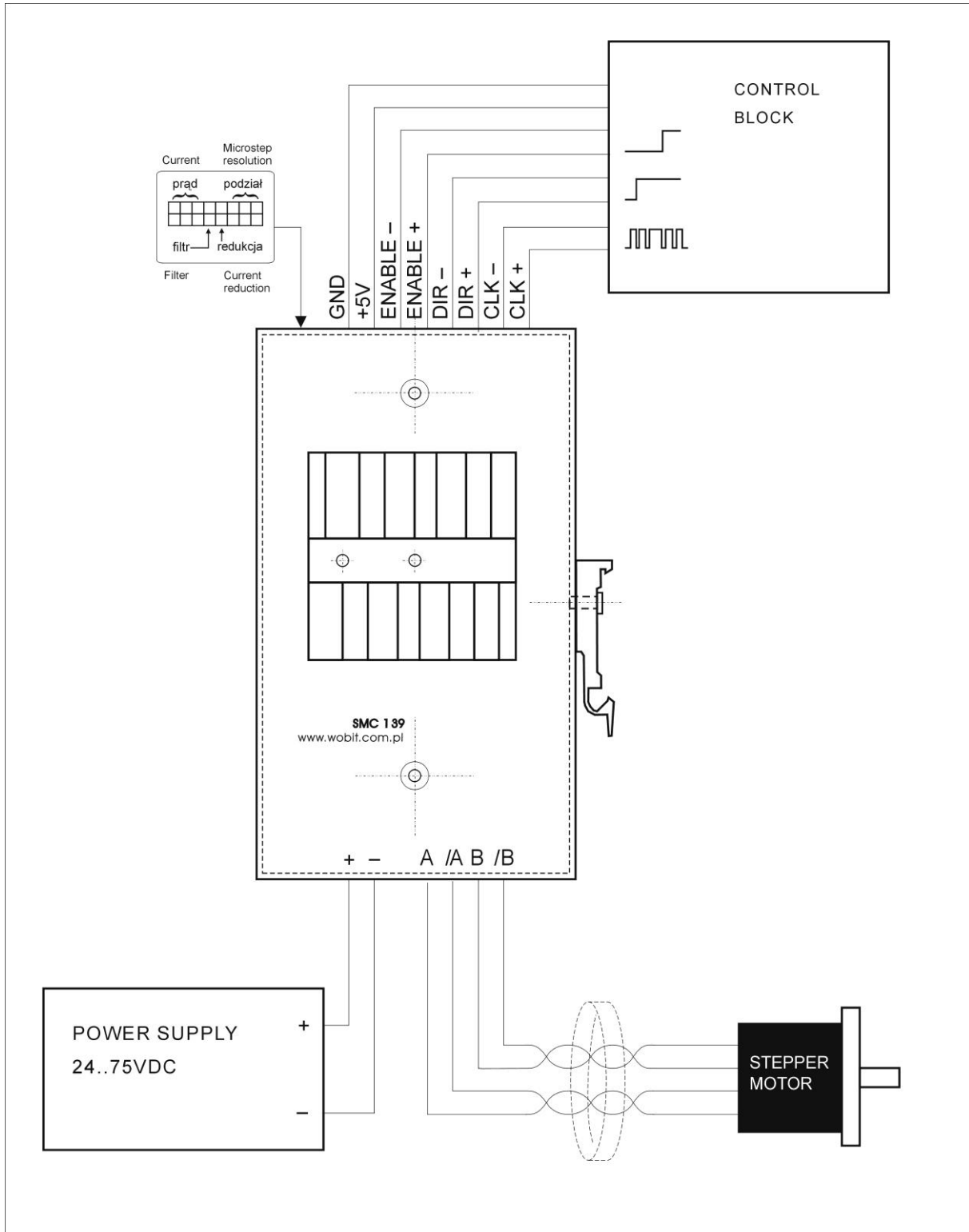
Features:

- microprocessor, FET lowRon power stages
- closed aluminum housing
- thermal and short-circuit protection
- wide range of supply voltage +24V.. +75V (80V max.)
- step frequency up to 50kHz
- filter option for step pulse input
- high output current – 8.2A per phase
- current setting by miniature DIP switches
- advanced SMD technology
- microstep resolution up to 1/10 (full step, 1/2, 1/4, 1/8, 1/16, 1/5, 2/5, 1/10)
- works with 2 phase stepper motors
- optoisolated inputs
- chopper frequency – 25kHz
- automatic current reduction



- power on indicator – red LED
- additional, galvanically isolated power supply (5VDC) for driving optoisolated inputs
- cooler

3. Driver connections



connectors „+” and „-” - 24..75VDC – power supply

A – coil beginning of phase A

/A – coil end of phase A

B – coil beginning of phase B

/B – coil end of phase B

CLK+ – anode CLK

CLK- – cathode CLK

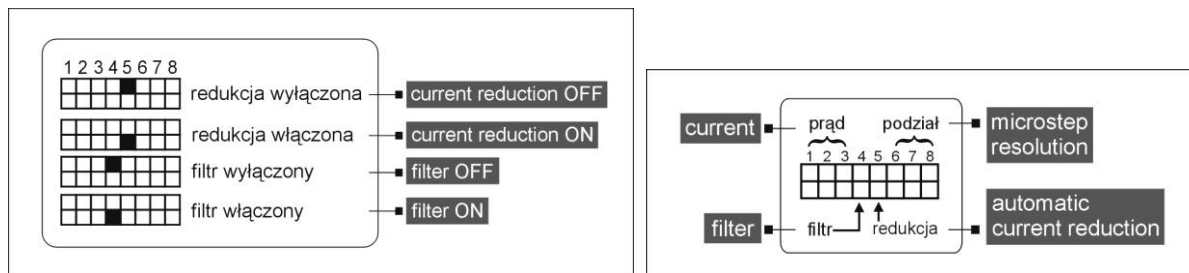
DIR+ – anode DIR

DIR- – cathode DIR

EN+ – anode ENABLE

EN- – cathode ENABLE

+5V – additional, galvanically isolated power supply (5VDC) for driving optoisolated inputs (max. 50mA)



DIP switch description

Current reduction – automatic current reduction. It turns on when there is no pulses on CLK input by time about 0,5s. It reduces coil current by 50%.

Filter – noise canceller

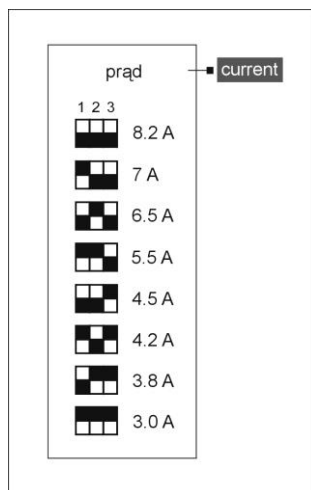
Current – current setting

Microstep resolution – microstep setting

4. Adjustment of motor phase current

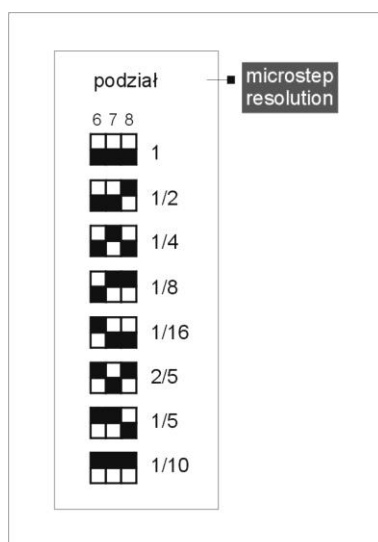
Coil current is set up by DIP switches according to the following drawing.





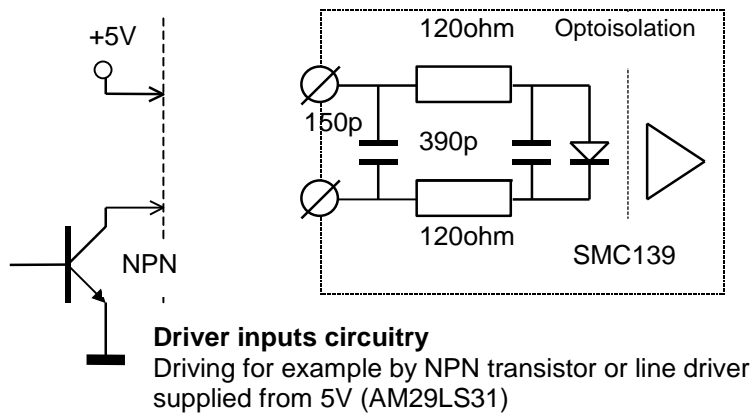
5. Step pulse and direction inputs description

Microstep resolution is set up by DIP switches according to the following drawing.



6. Step pulse and direction inputs description

All input signals of SMC139 are optoisolated. Applying Enable signal (current about 5-7mA – max 20mA - must flow by optocoupler) allows motor current flowing. Example of input driving is presented on the following drawing. Control signals could be generated by a simple generator (e.g. GEN2), micro indexer (MI1.3.2), PLC or microcontroller.

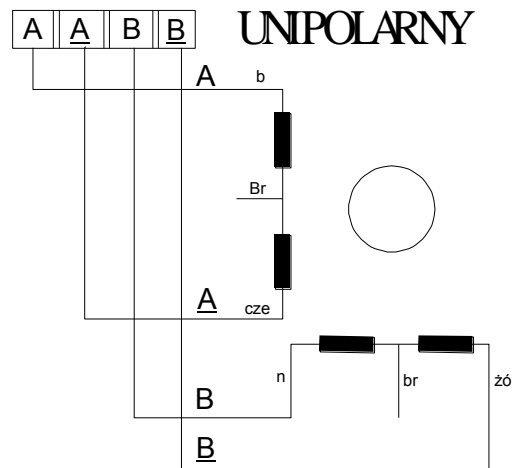
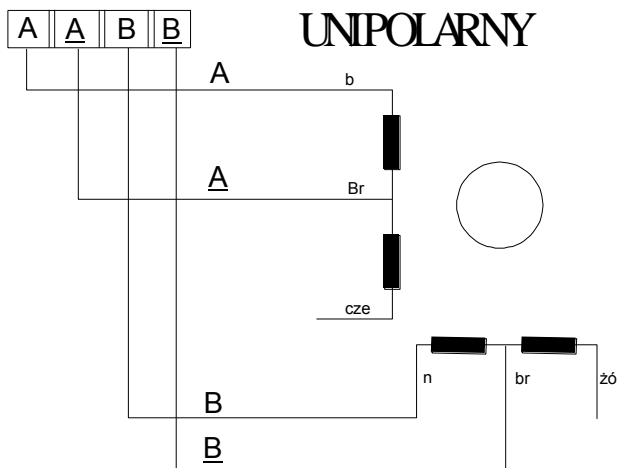
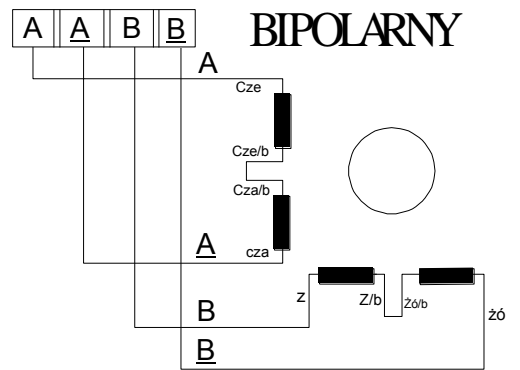
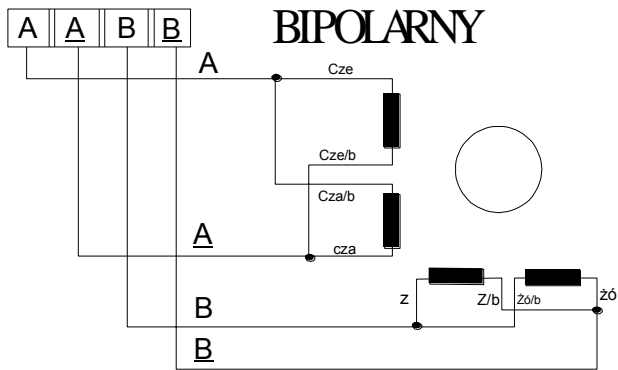


7. Power supply

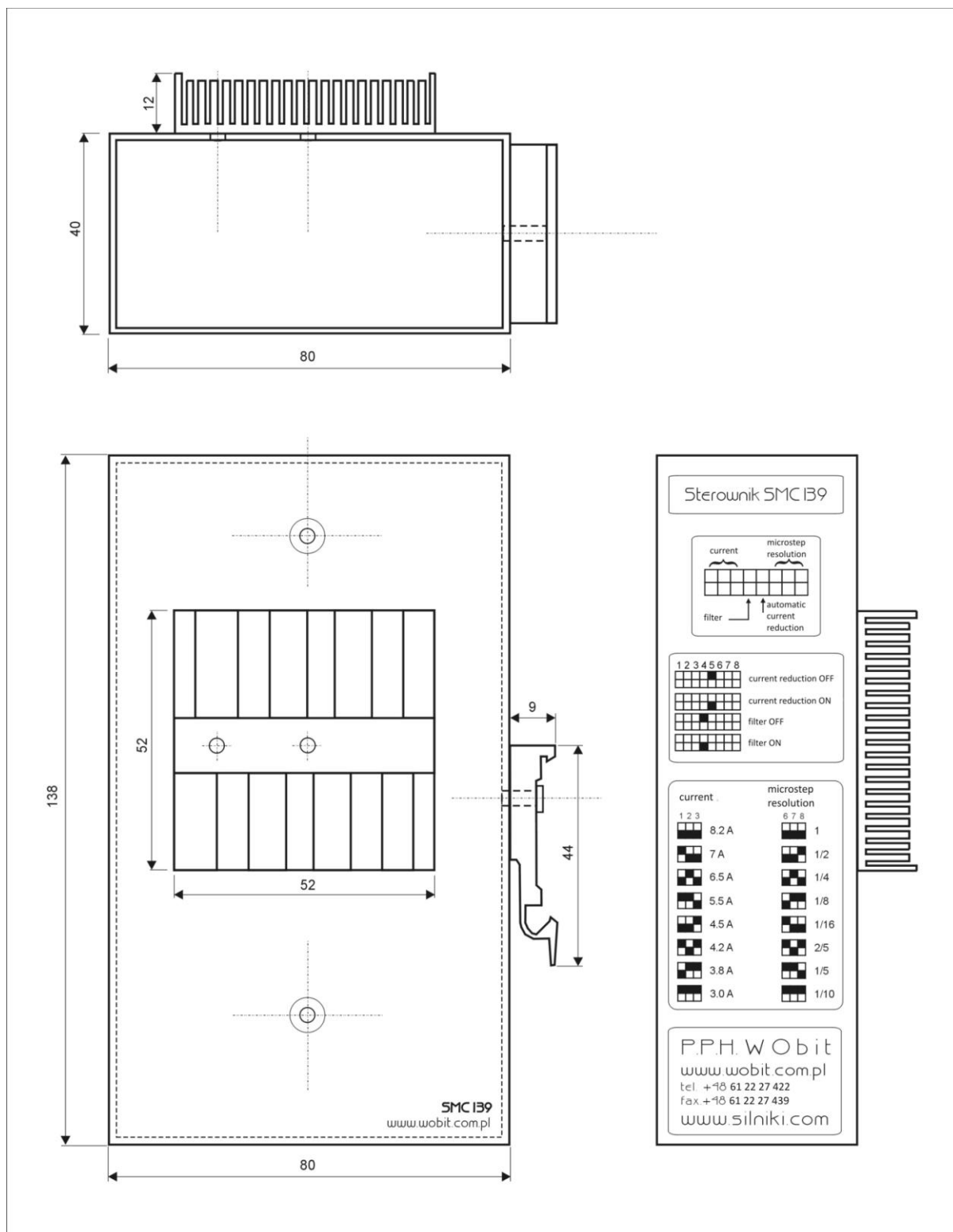
SMC139 driver should be supplied from non-stabilized power supply. The power supply must have an output capacitor of at least 10000uF for optimum operation (back EMF compensation). To minimize cable induction, this capacitor shouldn't be connected more than 1m from the driver. Power supply should have slow-blow fuse to protect driver (driver doesn't have internal fuse). Maximum power supply voltage should be lower (by a few volts) from 75V, because during driver operation, there is a voltage adding to supply voltage (voltage generated in motor – back EMF). Safety voltage range is 60 – 72 VDC. In case when driver work with high voltage (about 70V) there is recommended to use big Zener diode, which will be cutting high speed voltage peaks. While the driver is first time turning on, it is recommended to use ampere meter (analog device is the best choice for this purpose) to monitor supply current. Output current measurement is possible using oscilloscope, and small series resistance connected to motor coils (for example 0,01ohm 2W 1% tolerance). It is very important that GND of oscilloscope **IS NOT** connected with GND of driver, and because of that using second channel to see two phases on the same time is forbidden! (GND's of both channels of oscilloscope are internally connected).

To supply SMC139 driver it is recommended to use power supplies produced by WObit - ZN250M or ZN350M.





8. Physical dimensions



9. Technical specification

Supply voltage:	+24V ..+75V (80V max.)
Suggested supply voltage	+36V ..+72V
Phase current:	3 .. 8,2A
Isolated inputs:	3 (step, dir, enable)
STEP frequency:	50kHz
Resolution (motor 1,8°):	200, 400, 500, 800, 1000, 1600, 2000, 3200 steps per revolution
Power supply indicator:	red LED
Operating temperature:	0 +60°C
Cooling version:	W – cooler
Mechanical dimensions:	80x139x40 (housing without cooler)



10. Useful tips and safety directions

1. Driver is capable of producing rapid movements and very high forces. Unexpected motion may occur especially during the development of controller programs. KEEP WELL CLEAR of any machinery driven by stepper motors. Never touch any part of the equipment while it is in operation!
2. There is recommended to twist motor wires in pairs (one phase – one pair). If the noise generated by motor wires is too big to accept, wires should be shielded, and shield should be connected to the driver GND. To reduce generated noise, ferrite rings should be used.
3. As signal wires may be used cross-section AWG14 to 28, and to supply AWG22 or greater.
4. Signal wires should be keep as far as it is possible from supply wires. Minimum distance between this cables is 10cm. Never twist this cables together!
5. It is recommended to mount motor to metal devices of machinery because of that the working temperature of motor is about 70°C. Motor temperature monitoring is also recommended (maximum motor temperature is 85°C).
6. It is recommended to mount driver as close to motor as it is possible.
7. Ends of motor wires should be soldered to provide good connection.
8. Motor wires have a possibility to connect phases in series or parallel. Selection of serial or parallel connection of the motor phases is typically determined by the speed requirements of the system. If slow speeds are required, the motor can be connected in serial. For operation at higher speeds, the motor phases can be connected in parallel.
9. In case of transferring torque on other axis, it is recommended to use couplers. It lets to eliminate deviation of shaft position, and increase motor bearings lifetime. Oldham type couplers are very good for this purpose.
10. Mechanical modification of motor shaft is not allowed. Any mechanical interference causes lost of motor torque.
11. Magnetic or viscosity resonance suppressor could be used to correct dynamic characteristic.
12. Never connect wires from non discharged power supply (capacitors in power supply could keep energy by long time). To discharge capacitors, just short by low resistance resistor power supply terminals for a moment. Do it only when power supply is turned off.

