

User manual

SDC107



DC motor driver up to 6A

With speed, current and direction of rotation control



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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 and keep it for further use.
- Provide appropriate working conditions in compliance with the device specification (e.g.: power supply voltage, temperature, maximum current consumption).
- Protect inside of the device from any liquids or elements – it can cause electric shock and damage of the device.
- Basic features which knowledge and use will provide safe use consonant with its designation will be demonstrate on the device or in this manual.
- The device with its parts is manufactured in way to provide its safe mounting and connection.
- The device is designed and manufactured as to conform to the principles of protection against the threats mentioned above provided that the device is used in a manner consistent with its purpose and that it is properly maintained.
- The device can cause interference of sensitive radio and television devices in nearby.

1.2 Assembly recommendation

It is recommended to follow measures described below to prevent any possible interruptions of the device operation:

- Minimize influence of external interference.
- **To minimize noises** please use **screening** of the connecting cable with a motor. It is recommended to use a **ferrite bead** assumed on the motor wire in close to the driver.
- **Please avoid** leading signal cables **in close to electrical and power wire of the motor**; signal cables should be possibly short.
- While using servomotors powered from the same grid it should be equipped with proper power filters to eliminate noises which can influence on driver operation. Using filters might be necessary also to eliminate noises from the grid.

2. Device description

2.1 Intended use

SDC107 is a driver designed for DC motors with power up to about 150 W.

The driver allows, to control the **motor** speed and direction of rotation, and the active reduction of the maximum current drawn by the motor (6 A).

The **motor** speed can be set via an external signal 0-5 V or via the built-in potentiometer.

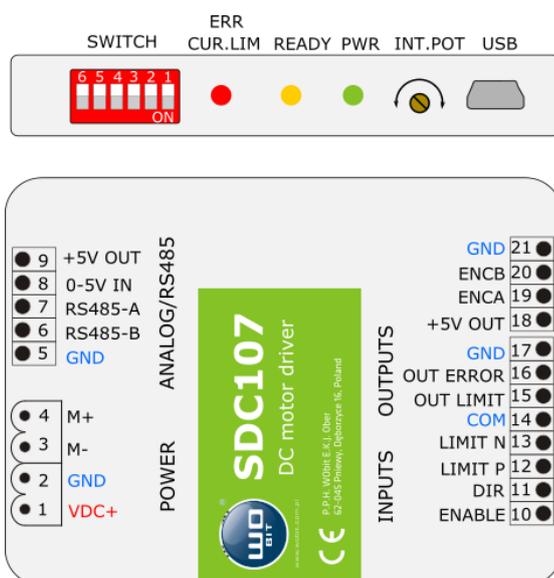
Motor operation control (work permit, change of direction of rotation, end inputs) is carried out using optoisolated **ENABLE / DIR / LIMIT N / LIMIT P** inputs.

The current limit function (regulated by an external 0-5V signal or built-in potentiometer) allows limiting the maximum current consumed by the motor and prevent it from overheating or damage.

Features:

- Continuous current up to 6 A
- Voltage supply 12..36 V
- Maximum current limit to prevent motor overloading
- Motor speed / current regulation by an external 0-5 V signal or built-in potentiometer
- Quick configuration using 6 switches on the front panel of the driver
- 5 V output for supplying an external potentiometer
- Optoisolated inputs for the activation (ENABLE), the direction (DIR) signals and the limit (LIM N, LIMP)
- 2 outputs (PNP) signaling error and achieving max. current
- LED indicator for power, status and error
- Overcurrent and short circuit protection of power amplifiers
- Thermal protection
- Compact housing adapted for mounting on a DIN rail

2.2 Description of connectors and indicating lamps



Picture. 1 Description of connectors and panel.

No.	Description	
Power supply		
1	VDC+	Power supply 12 - 36 VDC
2	GND	Ground for power supply
3,4	M+,M-	Terminals for motor
Input 0-5V		
5	GND	Ground for signals
6,7	RS485	RS485 Modbus interface (optionally)
8	0-5V	Analog signal input for speed / current regulation
9	+5V OUT	+ 5V output for powering an external potentiometer
Input		
10	ENABLE	
11	DIR	Input for direction select
12	LIMIT P	Input for limit switch P (for direction DIR=1)
13	LIMIT N	Input for limit switch N (for direction DIR=0)
14	COM	Ground for inputs
Outputs		
15	OUT LIMIT	Output indicating a current limit
16	OUT ERROR	Error output
17	GND	Ground (common with power supply)

Signalization diodes description	
 POWER	Signalization of driver power supply
 ERR / CUR.LIM	Error signaling / current limitation: <ul style="list-style-type: none"> ▪ flashing quickly - error (short circuit or overload) ▪ blinking slowly - error (supply voltage / temperature exceeded) ▪ on - the current limit set or driver max. current has been reached
 READY	Motor operation signaling: <ul style="list-style-type: none"> ▪ on - motor running (ENABLE = ON) ▪ flashing - end limit input active (ENABLE = ON and active LIMIT N or P*) <p>* active limit = high state at LIMIT input for switch LIMIT-LEVEL = OFF, or low state for switch LIMIT-LEVEL = ON</p>

Switches description		
S1	POT-INT	Activation of speed control from the internal potentiometer
S2	POT-MODE	Current limit mode
S3	SOFT-START	Soft start function
S4	BRAKE-STOP	Braking function in the absence of ENABLE signal and limit signals
S5	LIMIT-LEVEL	Change of polarization of limit sensor inputs (S5 ON - limit switch active in low state)
S6	AUTO-REVERSE	Automatic change of direction of rotation of the motor when reaching the limit sensor.

2.3 Power supply

Driver power supply

To power the driver, it is recommended to use a power supply with an output voltage equal to the rated voltage of the motor used (in the range of + 12 ... + 36 V) and current capacity appropriate to the motor power. In the case of larger motors, the power supply should allow receiving reverse energy from the driver, which is why it is not recommended to use stabilized power supplies, or it should be equipped with additional capacitors at the output with a capacity of min. 4700 uF.

Output +5V OUT

Driver facilitate +5 V voltage which can be used for supplying of external potentiometer connected 0-5 V IN input. Maximal current consumption for all +5 V outputs can't exceed 100 mA.



CAUTION!

Clenching +5 V OUT output with ground (GND) or with power supply (VDC+) can cause damage of the driver.

2.4 Driver's outputs

The driver has two PNP OC type outputs with max. 40 mA load. An active output causes the appearance of a VDC supply voltage.

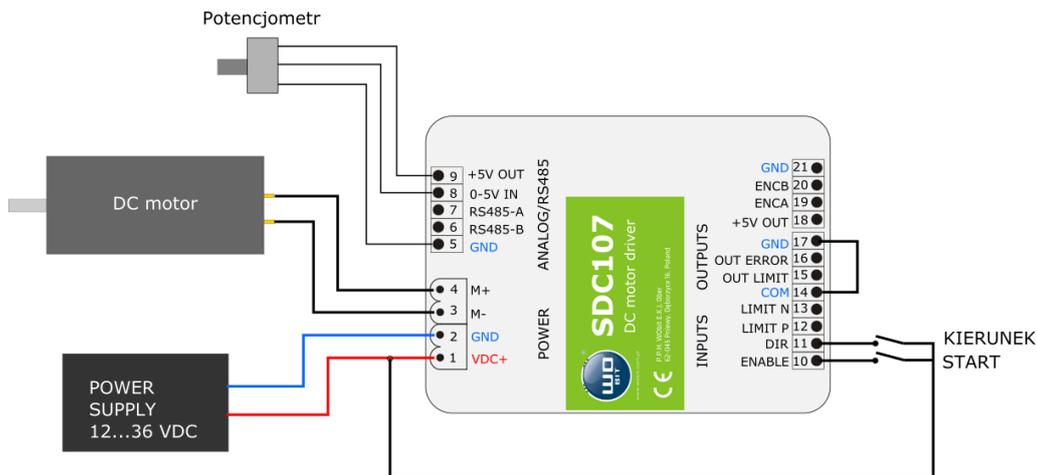
- OUT OUT ERROR output - active in the event of a driver error
- OUT LIMIT output - active when the motor reaches the set current limit. It can be used e.g. to signal mechanical blocking of the motor, etc.



CAUTION!

The outputs are not suitable for supplying actuators (electromagnets, contactors, etc.). They are intended as diagnostic information for a superior control system (e.g. PLC).

2.5 Connection example



Picture. 2 Basic signal connection.

2.6 Error signaling and reset

The driver can signal following errors:

- Overload or short circuit (ERROR LED flashes quickly)
- Power supply / temperature exceeded (ERROR LED flashes slowly)

In the event of an error, the motor is turned off, the ERROR LED flashes and the OUT ERR output passes high.

To reset the error and continue the driver operation, remove and provide the ENABLE signal again.

3. Driver configuration

The device is configured using the switches on the front panel.

Switch	Function	Description
S1	POT-INT	Activation of speed control from the internal potentiometer
S2	POT-MODE	Current limit mode
S3	SOFT-START	Soft start function
S4	BRAKE-STOP	Braking function in the absence of ENABLE signal and limit signals
S5	LIMIT-LEVEL	Change of polarization of limit sensor inputs (S5 ON - limit switch active in low state)
S6	AUTO-REVERSE	Automatic change of direction of rotation of the motor when reaching the limit sensor.

3.1 Speed/current regulation (S1/S2)

The maximum speed and current of the motor are regulated using an external 0-5 V voltage supplied to the 0-5 V IN input and a built-in 10-turn potentiometer.

Depends on S1 and S2 switches settings following combinations are possible:

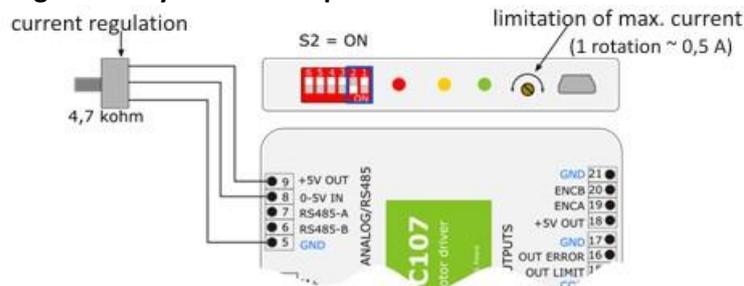
S1 (POT-IN)	S2 (POT-CUR-MODE)	Function of 0-5V input	Potentiometer function
OFF	OFF	Speed control	--- *
ON	OFF	--- *	Speed control

OFF	ON	Speed control	Current limitation
ON	ON	Current limitation	Speed control

In cases of using the built-in 10-turn potentiometer to set the desired current:

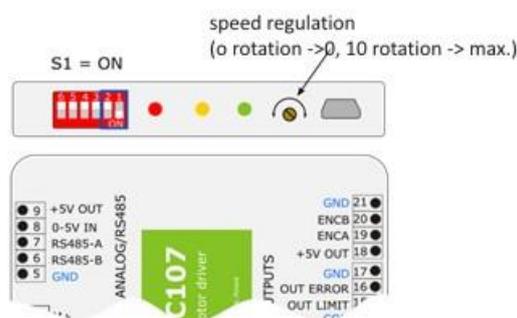
- turn the potentiometer maximally to the left (make 10 turns or until you feel resistance)
- turn the potentiometer clockwise X times 0.5 A (e.g. for 2 A current turn 4 turns).

A) Example: Speed regulation by an external potentiometer and current limitation using built-in



Picture. 3 Speed regulation by external potentiometer with current limitation.

B) Example: Speed control with built-in potentiometer without current limitation max. (~ 6 A)



Picture. 4 Speed control with built-in potentiometer.

3.2 SOFT-START function (SOFT-START - S3)

The S3 switch enables activation of the SOFT-START function, which causes a soft start of the motor (the delay in reaching the maximum speed is about 2 seconds).

Activation of the function may be necessary when controlling motors with more power or driving mechanisms with greater inertia. Otherwise, the driver may indicate overload during the start or reversing at a higher speed.

3.3 Dynamic brake function (BRAKE-STOP – S4)

Switching S4 to ON enables the dynamic braking function. Then, removing the ENABLE signal or giving a signal to the limit input (LIMIT N or P) causes the motor to stop abruptly. During such braking, the energy from the motor is returned by the driver to the power source.

CAUTION!



During dynamic braking, the energy of the accelerated motor is returned by the driver in the form of voltage to the power source (the motor then works as a generator). Therefore, it is necessary to provide power supply to the driver to collect reverse energy - e.g. equip the power supply with large electrolytic capacitors. Therefore, the use of switched-mode power supplies is also not recommended.

3.4 Position limit inputs (LIMIT-LEVEL – S5)

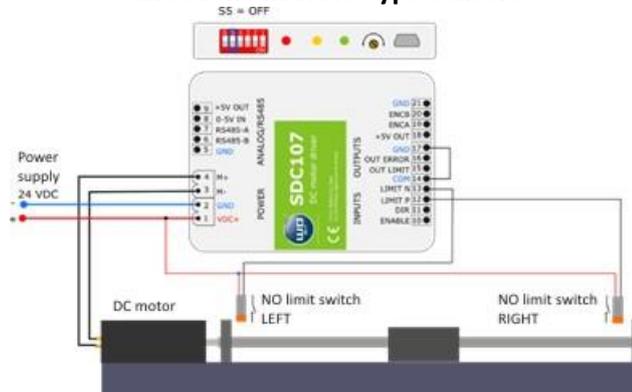
The driver has two inputs (LIMIT-L and LIMIT-P) allowing the motor to stop after activation of the input depending on the current motor direction (DIR input).

Direction DIR input	Input LIMIT-L	Input LIMIT-R	Operation status
OFF	Active	...	Stopped
OFF	Inactive	...	Operating
ON	...	Active	Stopped
ON	...	Inactive	Operating

The S5 switch determines the type of limit sensors used. When S5 = OFF it is for NO (Normal Open) sensors, when S5 = ON it is NC (Normal Close) sensors.

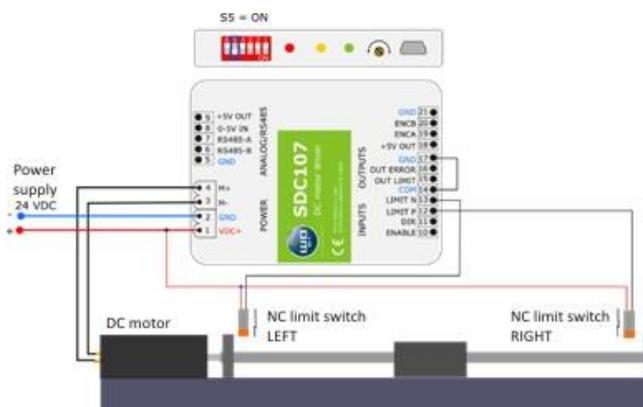
For 3-wire applications (e.g. inductive), use sensors with PNP output. When using sensors with NPN output, the LIMIT N / P input should be pulled up to + VDC with a 2.2k ohm resistor, taking into account the reverse logic of the sensors.

A) Example of connecting the driver to the motor driving the screw with limited movement in two directions with NO type sensors



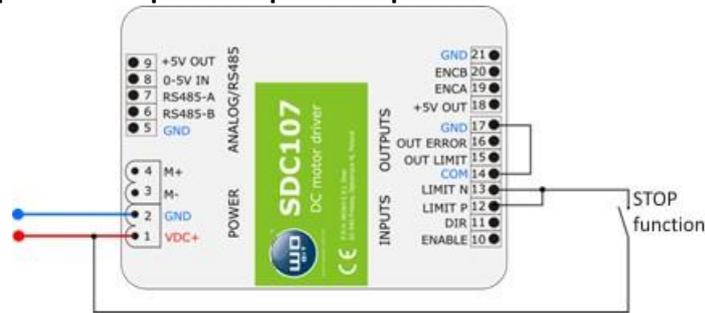
Picture. 5 Connection sensors NO type.

B) Example of connecting the driver to the motor driving the screw with limited movement in two directions with NC type sensors



Picture. 6 Connection sensors NC type.

C) Using the LIMIT N / P inputs as an input to stop motor operation



Picture. 7 Using LIMIT N/P inputs as "STOP" input.

3.5 Auto-reverse function (Auto-reverse - S6)

Turning on the Auto-reverse function (switch S6 = ON) automatically changes the direction of rotation of the motor when the limit switch is activated.

Auto-Reverse function operation:

- Starting the motor operation requires signal input to ENABLE.
- The motor moves in the direction depending on the signal at the DIR input.
- After reaching the extreme position and activating the LIMIT N or P sensor, the motor stops for about 3 seconds.
- After the time elapses, the motor moves in the opposite direction until the second LIMIT sensor is activated and the motor stops for 3 seconds. The sequence is repeated.

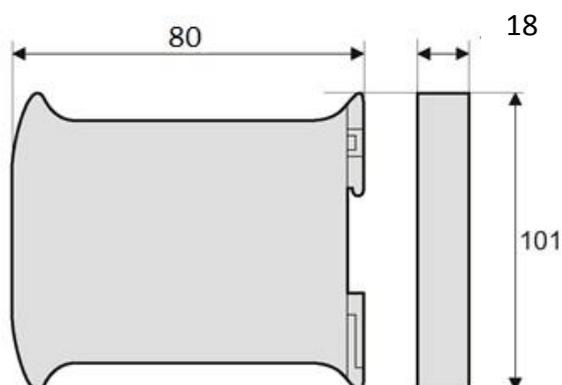
3.7 Driver software update

Putting all switches in the ON position and turning on the driver power supply causes its activation in the software update mode (via USB). Configuration S1..S6 = ON is therefore not allowed during normal operation of the driver.

4 Problems and solutions

The motor does not revolve	<ol style="list-style-type: none"> 1) Check if the green POWER LED is on. If not - no power supply to the driver or damaged driver. 2) Check if a signal is given to the ENABLE input. 3) Check if the LIMIT LED is flashing. If so, it means that the limit input is active (chapter 3.4) 4) Check if the red ERR LED is flashing. If so, it means the driver is in error mode. To clear the error, remove and re-enter the ENABLE signal. 5) Check the configuration of the S1 / S2 switches (chapter 3.1). 6) If external control is active, check that the control voltage has been applied (0..5 V).
The driver signals an error after changing the direction of rotation or switching on.	The motor starting current is too high. The driver signals when the max current is reached or goes into error mode (the ERROR LED flashes). It is recommended to enable the SOFT-START function (switch S3 = ON).
The driver signals an error during braking.	For the active BRAKE-STOP S4 = ON mode, braking returns energy from the motor to the power supply, which may increase the power supply voltage. If the power supply is not able to receive such energy (too small electrolytic capacitors at the power output), the driver supply voltage may exceed the max. value (40 V). Then the driver will go into error condition.
The driver signals an error as soon as the ENABLE signal is activated.	Check for a short circuit between motor leads or between the M + or M- signal and GND or VDC. If the error repeats and cannot be cleared, the driver has been damaged.
The motor is spinning slowly, the red LED is on.	The motor current limit is active. Check the configuration of the S1 switches and S2 and depending on the set mode, increase the current limit with the built-in potentiometer or an external 0-5V signal.

5 Technical parameters



Mechanical parameters	
Housing dimensions:	101 x 18 x 80 mm
Weight: approx.	100 g
Operating temperature range:	5..50 °C
Protection degree:	IP20
Mounting	DIN rail

Electrical parameters	
Power supply VDC+	12...36 VDC
Current consumption	Motor turned off: 50 mA
Output +5 V	5 V, max. current consumption 100 mA.
Max. Motor constant current	6 A
Analog input 0-5 V IN	0-5 V, input resistance 4,4k ohm.
Control inputs ENABLE, DIR, LIMIT N, LIMIT P	Optoinsulated, low level <2 V, high level > 5 V (max. 36 V)
Outputs OUT ERR, OUT LIMIT	Transistor PNP (source), max. 50 mA
PWM frequency of the power stage	20 kHz
Operating temperature range	0...+50 °C