

SAMOTRONIC102 (4 636 6733 0)

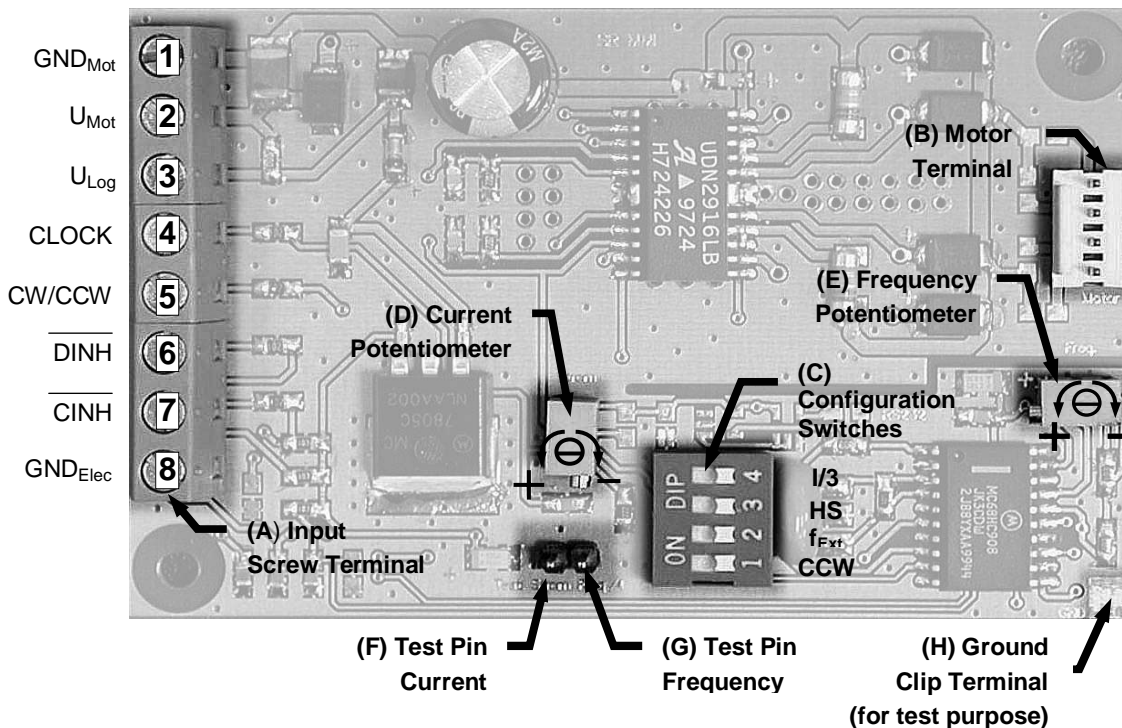
Short Reference Bipolar Stepper Motor Driver

1. Introduction

The SAMOTRONIC102 is designed for use with Saia-Burgess 2-phase bipolar stepper motors. It shall help you to run a stepper motor in laboratory bench tests as well as in small quantity series.

Features:

- 10-24VDC supply standard voltage mode (10-42VDC as an option in enhanced voltage mode)
- 71-500mA chopper controlled coil current
- Chopper frequency typically 20kHz
- Internal (50-1325Hz) or external clock (up to 2kHz)
- Half step / full step mode
- Internal clock inhibit and motor current inhibit
- Test pins for current and step frequency
- Possibility to preset and exchange direction
- 2 mounting holes with diameter 3,2mm
- Dimension 84mm x 54mm only
- Ambient temperature operation -20°C to $+60^{\circ}\text{C}$
- Ambient temperature storage -20°C to $+80^{\circ}\text{C}$



Take care on the input levels (LS-TTL-signals). For a LOW signal, a true ground connection is required. If an input is left open it is detected as HIGH. Input signals $>5\text{V}$ may destroy the SAMOTRONIC102.

2. Inputs

This section describes the input screw terminal (A). There are no other input facilities on the PCB!

No.	Name	Function	Level	Description
1	GND _{Mot}	motor ground	GND	ground connection for the supply voltage
2	U _{Mot}	motor supply	10-24 (42) VDC	positive supply voltage for motor.
3	U _{Log}	logic supply	10-24 VDC	Not used in standard voltage mode (10-24VDC). (positive supply voltage for control electronic in enhanced voltage mode)
4	CLOCK	motor clock	LS-TTL	Input for the motor clock. The maximum frequency is 2kHz. One step will be done on every falling edge of the clock signal (minimum pulse width 100µs)
5	CW/CCW	motor direction	LS-TTL	open or HI – direction 1 connected to ground or LOW – direction 2 Actual direction depends on setting of configuration switch 1 in (C) and on motor connection.
6	DINH	driver inhibit	LS-TTL	Use LOW (connect to ground) to inhibit the driver. In this case, the motor current is off and the motors last current pattern is saved until the current is again switched on.
7	CIHN	clock inhibit	LS-TTL	Only active if system runs with internal clock. Use LOW (connect to ground) to inhibit the internal clock generator. In this case, the motor current is still on with motors last current pattern. Take care not to overload reduced duty cycle motors!
8	GND _{Elec}	control signal ground	LS-TTL	It is advised to use this input with external control signal on terminals 4-8. Use it as a direct ground connection between your control equipment and the SAMOTRONIC102.

Logic level: LS-TTL LOW 0V to <0.8V
 HIGH >2V to 5V

3. Configuration Facilities

3.1 Configuration Switches

Switch 1 – CCW

Position	Function
OFF	Direction 1 Actual direction depends on setting of terminal 4 in (A) and on motor connection.
ON	Direction 2

Switch 2 – f_{EXT}

Position	Function
OFF	Unit runs with frequency from internal clock generator, use potentiometer (E) to modify frequency.
ON	Unit runs with external frequency, injected on terminal

Switch 3 – HS

Position	Function
OFF	Motor runs in Full Step Mode
ON	Motor runs in Half Step Mode

Switch 4 – I/3

Position	Function
OFF	Phase current range 214-735mA ± 10% Use potentiometer (D) to modify current.
ON	Phase current range 71-245mA ± 20% For better tolerances use a chip resistor on the PCB and ask your local Saia-Burgess sales representative for the modification.

3.2 Frequency Potentiometer (E)

This potentiometer is used to modify the internal clock generator and therefore, the motor step frequency (see also chapter 0. 4.3. Test Pin Frequency).

3.3 Current Potentiometer (D)

This Potentiometer is used to modify the chopper current. It sets the comparator level for the internal chopper circuit. Current Range depends on setting of Switch 4 in (C) (see also chapters 0.)4.2. Test Pin Current).

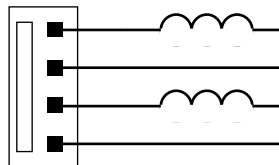
While it is possible to set currents up to 735mA that may overload the driver, depending on environmental conditions. Please contact your local Saia-Burgess sales representative to get a permission for use at coil currents above 500mA.

4. Outputs

4.1 Motor Terminal

The motor terminal is an 4 pin AMP MTA-100 straight post header (AMP-No. 640456-4). Therefore the motor must be equipped with the 4 pin MTA-100 receptacles. Use AMP-No. 640442-4 (ASN **440849540**) for cables AWG26 and AMP-No. 640441-4 (ASN **440849620**) for cables AWG24.

Connection on the PCB:



4.2. Test Pin Current

The test pin is to measure the chopper level that is preset by the potentiometer (D). At the pin the reference voltage V_{REF} is measured. The chopper comparator level I_{TRIP} is then calculated by:

$$I_{TRIP} = \frac{V_{REF}}{6.8} \quad \text{with } [I_{TRIP}] = A, [V_{REF}] = V$$

This signal is a representation of the current in the coil. This signal is the comparator level at which the current is switched off. The real RMS-value of the current needs to be measured.

Note that this pin is only made for set up purpose and not for use in application. Do not touch it without electrostatic protection.

4.3. Test Pin Frequency

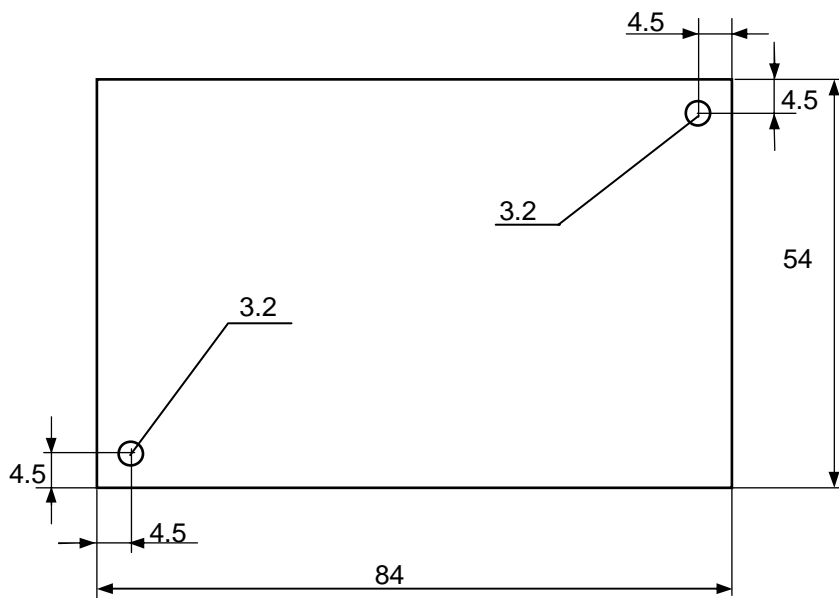
The frequency at this pin is a quarter of the step frequency.

Note that this pin is only made for set up purpose and not for use in application. Do not touch it without electrostatic protection.

4.4. Ground Clip Terminal (for test purpose)

The ground clip terminal (H) may be useful to connect a ground clamp while measuring at the test pins. This is helpful especially if an oscilloscope is used.

5. Mechanical Dimensions (in mm)



6. Mounting

The unit must be installed in a case so that the user is not able to access it while working. Otherwise the unit must be used in an anti-static environment and the user must be discharged with standard ESD-protection equipment. (Read section Extras for further information on EMC).

Take care to leave minimum distance between the PCB and holes in the case to prevent electrostatic discharges. A typical value is 8mm. This distance is, corresponding to DIN-VDE0110-1, large enough to withstand electrostatic generated voltages up to 8kV (this is a typical test value in EN50082-1/2).

But the distance also depends on environment, humidity and temperature conditions. It is user's responsibility to ensure an assembly that fulfils EMC requirements.

7. Cables

Max. cable length for all control inputs (screw terminal port 2-6) is 3m. At the clock input (screw terminal 4 in (A)) shielded wires must be used.

8. Additional Informations

8.1 EMC

The SAMOTRONIC102s is tested according EN 50081 (emission) as well as EN 50082 and EN 61000-6-2 (immunity).

8.2 Simplified Calculations of Duty Cycle and Input Power for the Motor

(all values at f=0)

- input power at 100% duty cycle:

$$P_{ED100} = \frac{U_k^2}{R_{ph}} \cdot 2$$

U_k...motor supply voltage from catalog
R_{ph}...phase (coil) resistance

- input power at current I:

$$P = 2 \cdot I^2 \cdot R_{ph}$$

- motors duty cycle:

$$ED = \frac{P_{ED100}}{P} \cdot 100\%$$

Duty Cycle is always based on a cycle time of 5 minutes!

8.3. Customer Specific Versions

By special agreements it is possible to deliver units with customer specific soft- and hardware. To order modified units please contact your local Saia-Burgess sales representative.

Note: A requirement specification is needed to check the request and to offer costs and delivery time.

8.3.1. Hardware Possibilities

The SAMOTRONIC102 is available in two voltage ranges.

- standard voltage mode 10-24VDC (order number: 4 636 6733 0)
- enhanced voltage mode up to 42VDC (order number: 4 636 6733 3)

Usage of enhanced voltage mode units requires a second power supply (10-24VDC) for the logic supply (terminal 3 in (A)). Therefore you need a PCB without Ω-bridge between terminals 2 and 3. Order this version by order number (4 636 6733 3).

8.3.2. Software Possibilities

The modification of software allows to use the PCB also in other applications. A few examples of possible customer specific changes are given below.

- frequency range – other values ore fixed frequencies
- inputs – other functions (for instance xx steps/pulse, start a travel sequence by applying a signal to an input, usage as analogue inputs...)
- compensated half step.

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