SmarAct GmbH

Step Direction Controller

OEM Board

SDC-1DS

Data Sheet

Flötenstraße 70
D 26125 Oldenburg
http://www.smaract.de
Tel.: +49 (0) 441 - 800879 - 0
Fax: +49 (0) 441 - 800879 - 21
E-Mail: info@smaract.de

Table of Contents

1 Manufacturer Declarations

1.1 Warnings and Safety Instructions

Please note the following warnings and safety instructions carefully when using the product.

1.1.1 Danger - Hazardous Voltage

The SDC controller described in this manual is capable of generating high output currents at high voltages. They may cause serious or even lethal injury if used improperly.

- Do never touch any part that might be connected to an output with a high voltage.
- Do not connect products from other manufacturers to the output connectors.

Output connectors with dangerous signals are labelled with the following symbol:

Please note that the Sensor Modules connected to these connectors have pins with a high voltage, too.

1.1.2 Caution - Installation Instructions

The SDC controller controller must be installed horizontally with 3cm air circulation area behind the ventilator. Insufficient air flow can cause overheating, which can result in a limited functionality of the controller.

2 Safety Precautions

To avoid damage of the SDC controller or the positioners used, please note the following precautions while using the products.

- It can't be guaranteed, that the SDC controller is able to drive stepping positioners from other manufactures without damage. Also do not try to drive the positioners with other controllers than those from SmarAct. Using other controllers my cause serious damage.
- Always make sure that the SDC controller and especially the ventilator is not blocked up by other devices.
- Please avoid dusty or high humidity working environments.

3 Overview

3.1 Driver

With the SDC-1DS we offer a low level control system which allows you to use SmarAct's positioners in a stepper motor like manner. This allows you for example to replace stepper motors in your application. Thus you are able to profit from the performance of our positioners with minor changes in your control structure.

Position resolution [nm]	Max. stick-slip step frequency[*2] [kHz]	Max. velocity [mm/s]
< 1	18.5	about 15

3.2 Signal Descriptions

The following main signals are used on the SDC controller.

EXT_V_INPUT	Supply voltage, separated by filter
EXT_GND	Supply voltage ground, separated by filter from GND
AVCC	5V Analog supply voltage output. Can be charged with 100mA
GND	Ground
HV-OUT	Positioner driving signal
HV-GND	Ground for positioner driving signal
ON/OFF	Switches off the high voltage and / or control loop, depending on the DIP switch setting (see below)
ENABLE	Enables CLK input
DIR	Specifies the direction of the position change
CLK (Step)	Changes the target position
HOME	Indicates reference mark
LIM-	Indicates negative end stop
LIM+	Indicates positive end stop
SM-D+	RS-485 D+ signal for sensor module
SM-D-	RS-485 D- signal for sensor module
SM-5V	Power supply for sensor module, 5V DC
PC-RXD	Communication with PC (PC to controller)
PC-TXD	Communication with PC (controller to PC)

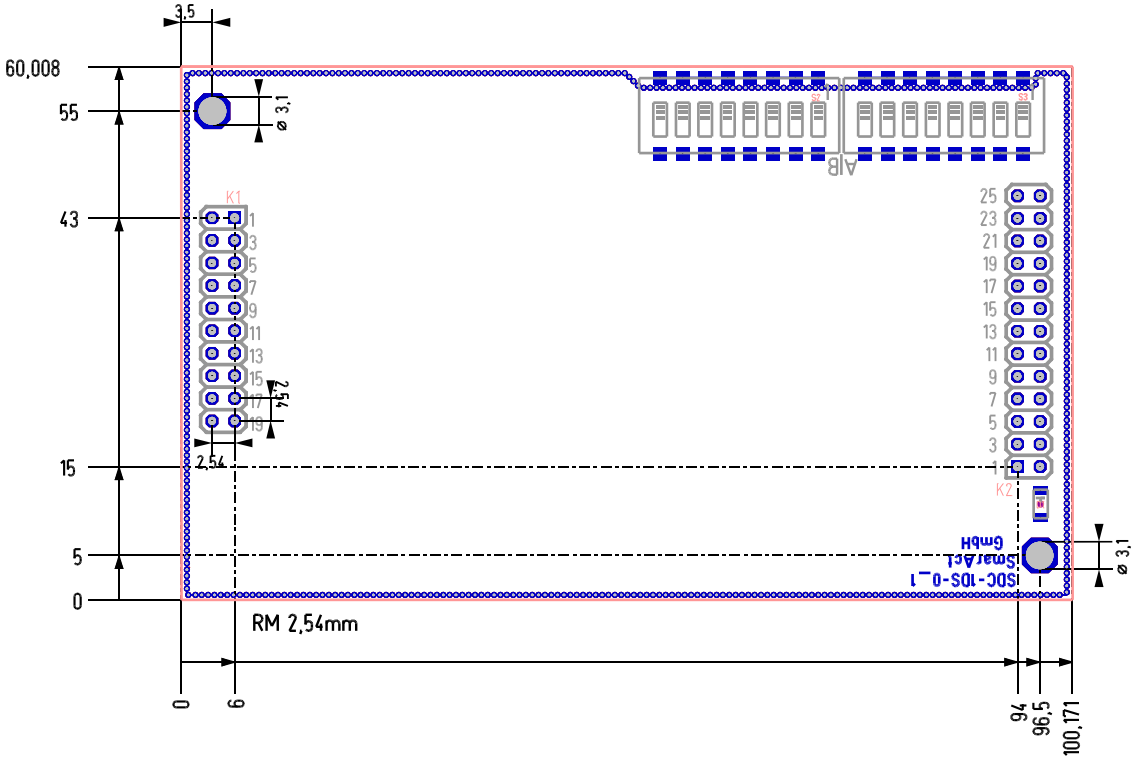
4 Technical Data

4.1 Power Supply

The SDC-1D has an operating voltage range of 12V to 48V at 24W.

4.2 Pin assignment

The pins on the SDC controller board are placed as follows:



The pin assignment is as follows:

Signal		Pin		Function	Specification
EXT_V_INPUT	K2	1, 3, 5	In	Supply voltage, separated by filter	+12V to +48V
EXT_GND	K2	2, 4, 6	In	Supply voltage ground, separated by filter from GND	
AVCC	K1	18, 20	Out	Analog supply voltage	+5V, max. 100mA
GND	K1	6, 8, 10, 12, 14, 16	Out	Ground	
	K2	8, 10 - 12, 14, 16, 18, 20 - 22			
HV-OUT	K1	1	Out	Positioner driving signal	0 – 100V, peak current 20A, average current 200mA
HV-GND	K1	2 - 4	Out	Ground for positioner driving signal	
ENABLE	K2	13	In	Enables CLK input	TTL 0 - 5V
DIR	K2	15	In	Specifies the direction of the position change	TTL 0 - 5V
CLK (Step)	K2	17	In	Changes the target position	TTL 0 – 5V f_{max} = 10 MHz
ON/OFF	K2	19	In	Switches off the high voltage and / or control loop, depending on the DIP switch setting (see below)	TTL 0 - 5V
SM-D+	K1	13	In	D+ signal for sensor module	RS485
SM-D-	K1	15	In	D- signal for sensor module	RS485
SM-5V	K1	17, 19	Out	Power supply for sensor module	+5V
HOME	K1	7	Out	Indicates reference mark	Open-collector, electrical specifications, according to the data sheet BC847
LIM-	K1	9	Out	Indicates negative end stop	Open-collector, electrical specifications, according to the data sheet BC847
LIM+	K1	11	Out	Indicates positive end stop	Open-collector, electrical specifications, according to the data sheet BC847
PC-RXD	K2	7	In	Communication with PC (PC to controller)	RS232 (serial interface)
PC-TXD	K2	9	Out	Communication with PC (controller to PC)	RS232 (serial interface)
	K1	7, 13, 15, 17, 19, 24, 26		reserved	DNC
	K2	13, 15, 17			

For all inputs, the input current is typically below 1mA.

4.3 DIP Switches

The pin assignment is as follows:

Switch	*Name*	*Function*
A1	MAXCLF0	Max closed-loop frequency index, bit 0: Off = 0, On = 1
A2	MAXCLF1	Max closed-loop frequency index, bit 1: Off = 0, On = 1
A3	MAXCLF2	Max closed-loop frequency index, bit 2: Off = 0, On = 1
A4	STEPINC0	Step increment index, bit 0: Off = 0, On = 1
A5	STEPINC1	Step increment index, bit 1: Off = 0, On = 1
A6	STEPINC2	Step increment index, bit 2: Off = 0, On = 1
A7	ONOFF_MODE	On/off mode: Off = high voltage, On = control loop
A8		reserved (off)
B1	SENSOR_MODE	Sensor mode: Off = powersave, On = enabled
B2	SENSOR_INV	Sensor inversion: Off = not inverse , On = inverse
B3	UART_BAUDRATE	RS232 baud rate: Off = 9600, On = 115200
B4		reserved (Off)
B5		reserved (Off)
B6		reserved (Off)
B7		reserved (Off)
B8	UART_EN	Enables serial interface.

Reserved switch's should be in Off position.

4.3.1 MAXCLF (Maximum Closed-Loop Frequency) (A1 - A3)

This value indicates with which maximum step frequency the piezo actuator is driven.

The bit combination A1 - A3 selects a frequency of the following table:

A3	A2	A1	decimal	MAXCLF
0	0	0	0	1000 Hz
0	0	1	1	2500 Hz
0	1	0	2	5000 Hz
0	1	1	3	7500 Hz
1	0	0	4	10000 Hz
1	0	1	5	12500 Hz
1	1	0	6	15000 Hz
1	1	1	7	18500 Hz

4.3.2 STEPINC (Step increment) (A4 - A6)

This value indicates by how many nanometers the target position changed for each incoming pulse on CLK (Step).

The bit combination A4 - A6 selects an increment of the following table:

A6	A5	A4	decimal	STEPINC
0	0	0	0	1 nm
0	0	1	1	5 nm
0	1	0	2	20 nm
0	1	1	3	100 nm
1	0	0	4	500 nm
1	0	1	5	2 µm
1	1	0	6	10 µm
1	1	1	7	50 µm

4.3.3 ONOFF_MODE (On/Off Mode) (A7)

This switch selects the functionality of the ON/OFF input signal.

Off	High Voltage: The ON/OFF signal switches the HV-OUT signal on or off. When switched off, the control circuit is disabled and the actuator is passive.
On	Control loop: The ON/OFF signal activates or deactivates the control loop. When activated the controller uses sensor feedback for the closed-loop positioning of the positioner.

4.3.4 SENSOR_MODE (Sensor Mode) (B1)

Off	Powersave: If the positioner is stationary, the sensor is operated in power saving mode. This mode reduces the heating of the positioner to minimize drift effects. Movements from standstill to run are delayed by a few milliseconds.
On	Enabled: The sensor is on permanently.

4.3.5 SENSOR_INV (Sensor Inversion) (B2)

This is a property that depends on the sensor and actuator of the attached positioner. This switch should be at the default setting and should be changed if the closed-loop function is not working properly.

Off	Sensor is not inverted
On	Sensor is inverted (default)

4.3.6 UART_BAUDRATE (RS232 Baud Rate) (B3)

Selects the baud rate for the RS232 interface. It uses eight data bits, no parity and one stop bit (8N1).

Off	9600 baud
On	115200 baud

5 Sensor Module

The sensor module can be integrated in a standard housing with a male D-SUB-15 connector to the SDC controller and a female D-SUB-15 connector to the positioner.

5.1 Connection to SDC-1DC Controller (DSUB 15, male)

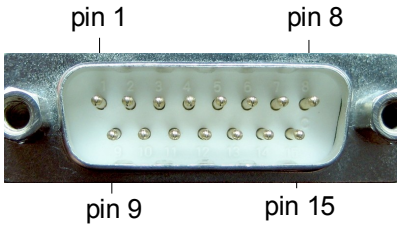
There are two different models of the sensor module.

- In the standard version the signals for the actuator (HV-OUT and HV-GND) are led through the sensor module.
- In a sensor-only version the signals for the actuator (HV-OUT and HV-GND) are led separately to the positioners.

5.1.1 Standard Version

The pin assignment of the male D-SUB-15 connector of a standard sensor module is as follows:

Pin	*Signal*	*Description*
1	HV-OUT	Positioner driving signal
2	d.n.c.	DO NOT CONNECT
3	d.n.c.	DO NOT CONNECT
4	SM-GND	Ground for sensor module
5	SM-D-	RS-485 D- signal for sensor module
6	d.n.c.	DO NOT CONNECT
7	d.n.c.	DO NOT CONNECT
8	HV-GND	Ground for positioner driving signal
9	d.n.c.	DO NOT CONNECT
10	d.n.c.	DO NOT CONNECT
11	d.n.c.	DO NOT CONNECT
12	SM-D+	RS-485 D+ signal for sensor module
13	d.n.c.	DO NOT CONNECT
14	SM-5V	Power supply for sensor module, 5V DC
15	SM-5V	Power supply for sensor module, 5V DC



5.1.2 Sensor-only Version

The pin assignment of the male D-SUB-15 connector of a sensor-only sensor module is as follows:

Pin	*Signal*	*Description*
1	d.n.c.	DO NOT CONNECT
2	SM-GND	Ground for sensor module
3	d.n.c.	DO NOT CONNECT
4	d.n.c.	DO NOT CONNECT
5	d.n.c.	DO NOT CONNECT
6	SM-D-	RS-485 D- signal for sensor module
7	SM-5V	Power supply for sensor module, 5V DC
8	SM-5V	Power supply for sensor module, 5V DC
9	SM-GND	Ground for sensor module
10	d.n.c.	DO NOT CONNECT
11	d.n.c.	DO NOT CONNECT
12	d.n.c.	DO NOT CONNECT
13	d.n.c.	DO NOT CONNECT
14	SM-D+	RS-485 D+ signal for sensor module
15	d.n.c.	DO NOT CONNECT

5.2 Connection to Positioners (DSUB 15, female)

The pin assignment of the female D-SUB-15 connector to the positioners is as follows:

Pin	Signal	Description
1	HV-OUT	Positioner driving signal
2	d.n.c.	DO NOT CONNECT
3	d.n.c.	DO NOT CONNECT
4	S-GND	Ground for sensor
5	S-SIN+	U1/sin+ signal from sensor
6	S-COS+	U2/cos+ signal from sensor
7	S-REF+	U0/reference+ signal from sensor
8	d.n.c.	DO NOT CONNECT
9	HV-GND	Ground for positioner driving signal
10	S-SCL	SCL for I²C bus, sensor programming
11	S-SDA	SDA for I²C bus, sensor programming
12	S-SIN-	U1/sin- signal from sensor
13	S-COS-	U2/cos- signal from sensor
14	S-REF-	U0/reference- signal from sensor
15	S-5.0V	Power supply for sensor, 5.0V DC