8SMC1-RS232

1.5A Microstep Driver with RS232 Interface

Datasheet

1 General information

1.1 Features

Electrical
- PWM chopper type current control (up to 1.5A per phase)
- Short circuit, overcurrent, overvoltage and temperature protections
- Screw mounted and easy to change current sense resistors
- 16 Screw mounted pins for all connections
- DC input voltage, double supply

Motion
- Resolution: full step, 1/2, 1/4, 1/8
- Speed up to 5000 steps/s
- Programmable speed and trip points
- Programmable accel and decel ramps
- Soft start/stop mode
- Opto-isolated synchronization I/O

Control
- Two knobs for manual
- Two programmable limit switches
- Revolution sensor
- Remote control via interface
- Graphical user interface for Windows 98/2000/XP

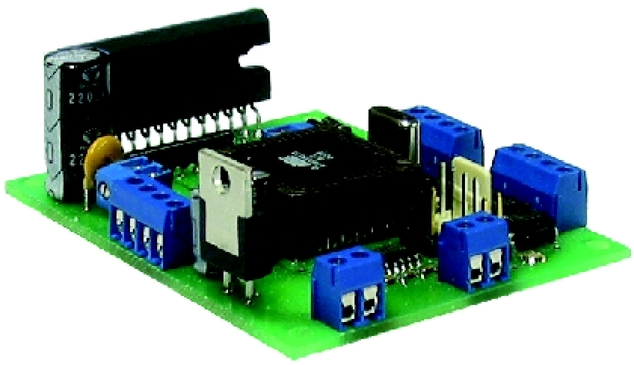


Figure 1. 8SMC1-RS232 with heatsink

1.2 Description

The 8SMC1-RS232 controller is designed to drive one bipolar stepping motor by local and/or remote means. Local control are implemented by two knobs. Remote control and monitoring are implemented via RS232 interface from PC. Inputs for two limit switches, emergency switch and revolution sensor are provided.

The 8SMC1-RS232 incorporates PWM chopper type sinusoidal micro step bipolar stepping motor driver, fully integrated mixed-signal System-on-a-Chip MCU and RS232 controller on one board. Rated current for each stepping motor is set by selection of two current sense resistors. The latter are screw mounted and easy to change. Sufficient set of resistors is supplied with 8SMC1-RS232. Controller features include built in over temperature, over voltage, short circuit and reverse supply protections. There is a potential of 40% current reduction in hold mode. In order to improve the high speed performance and to reduce heating separate supply for logic and stepping motor is used. All external connections are implemented on 20 pin terminal blocks without soldering.

The built-in powerful MCU on the 8SMC1-RS232 allows the user, via RS232 interface, to control parameters such as position, acceleration/deceleration ramps, velocity, direction, resolution, drive current, etc., to form simple or complex motions. Most of all commands are executed on-the-fly. All parameters can be saved on PC or in MCU flash memory. The 8SMC1-RS232 does not require power supply via RS232. It is possible to set up to 30 devices per RS232 host. In this case is not necessary to use any special hubs. The BIP 4.0 has a variety of built-in functions, including local control, programmable limit switch inputs, homing algorithm, programmable revolution sensor for stall detection and opto-isolated input/output for synchronization.

Thus 8SMC1-RS232 is compact, low cost microstep stepping motor driver with high functionality and RS232 interface.

1.3 Applications

STANDA manufactures a diversity of motorized devices such as translation stages, rotation stages, attenuators and other equipment. All stepper motors used in STANDA's motorized devices can be controlled by 8SMC1-RS232 controller. Controller can be used to drive motorizes devices of other manufacturers if stepper motor parameters match specifications for 8SMC1-RS232.

1.4 Compatibility

1.4.1 Connectivity

Controller is designed to work with IBM AT compatible computer systems (with 80486, Pentium or better processors) with Windows 98/2000/XP operation systems. The only requirement is presence of serial, RS232 port.

1.4.2 Stepper motors

Controller can operate with stepper motors according to the technical specification and wiring requirements. Maximum allowable average phase current is 1.5A, rated voltage is 40V.

1.5 Precautions

Reasons that might cause the 8SMC1-RS232 controller to malfunction:

- Any motorized device was connected to, or disconnected from the 8SMC1-RS232, while the controller keeps currents in the motor windings. Please avoid reconnecting the motor while a current is turned on.
- All equipment must be electrically grounded.
- Avoid installing wrong current sense resistors in 8SMC1-RS232.

1.6 Warranty

Standa warrants the controller card 8SMC1-RS232 for the period of 1 year from the date of sale.

2 Specifications

2.1 Electrical

Electrical specification for 8SMC1-RS232 is listed below:

DC input voltage, double supply	
Supply for board logic	7-12V, up to 150 mA
Supply for stepping motor	7-40V, up to 1.5A
Power dissipation without heatsink	up to 4 W
Power dissipation with heatsink	up to 40 W
PWM chopper type current control	
Chopping frequency	45 kHz
Maximum average phase current	1.5A
Maximum peak phase current	2.5A
Maximum output voltage	38V
Protections	
Short circuit protection	Yes
Overvoltage protection	Yes
Reverse supply protection	Yes
Connection	
Remote control	RS232 connector
Other connections	16 pins
Current sensing	

Set of screw mounted current sense resistors for currents	0.1-1.5A
Current reduction in hold mode	70%, programmable delay
Programmable inputs	
Limit switches	2
Revolution sensor	1
Local control knobs	2
Synchronization	1, opto-isolated
Programmable outputs	
Synchronization	1, opto-isolated

8SMC1-RS232 micro step motor controller requires dual power supply: one for board logic and another for stepping motor. Both power supplies must be constant-current source and have sufficient rated current. If supply voltage for board logic and stepping motor are equal, it is possible to use one power supply. In this case positive terminals 3 and 7 (see Figure 7) are connected together externally.

2.2 Motion

Motion specification for 8SMC1-RS232 is listed below:

Resolution	full step, half step, 1/4, 1/8
Speed	programmable, 0.1-5000 step/s
Position counter	-2.147.483.647 – 2.147.483.647
Accel and decel ramps	programmable
Soft start/stop mode	programmable

2.3 Remote control

Remote control specification for 8SMC1-RS232 is listed below:

Communication Protocol	RS232
Communications baud rate	9600bps
Max devices per host	30

2.4 Mechanical

Drawings for 8SMC1-RS232 are shown below:

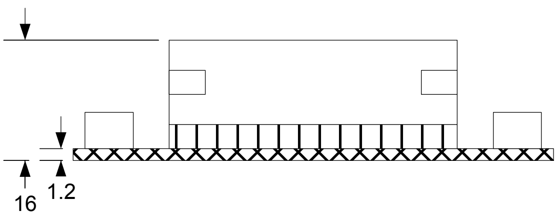


Figure 2. 8SMC1-RS232 Board front view

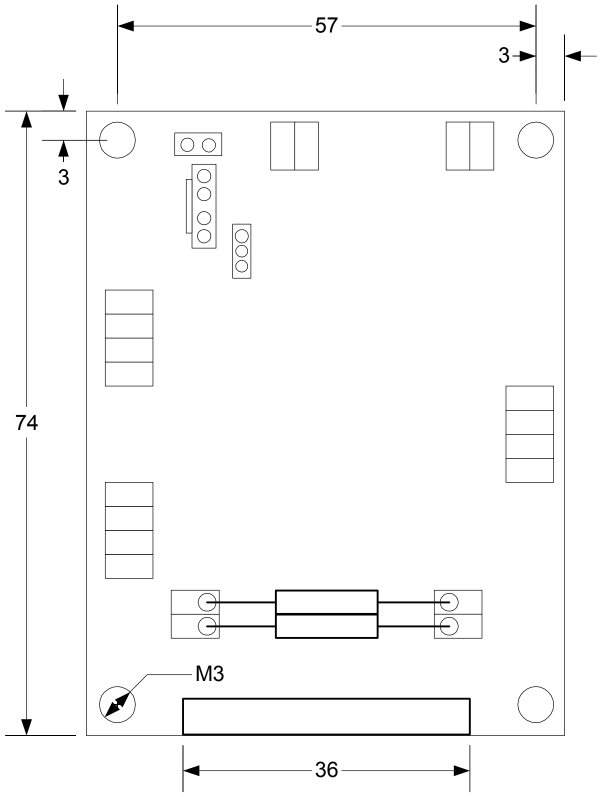


Figure 3. 8SMC1-RS232 Board top view

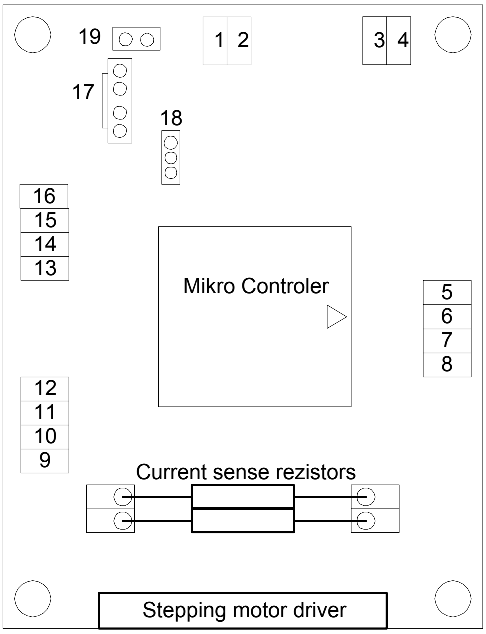


Figure 4. 8SMC1-RS232 Board layout

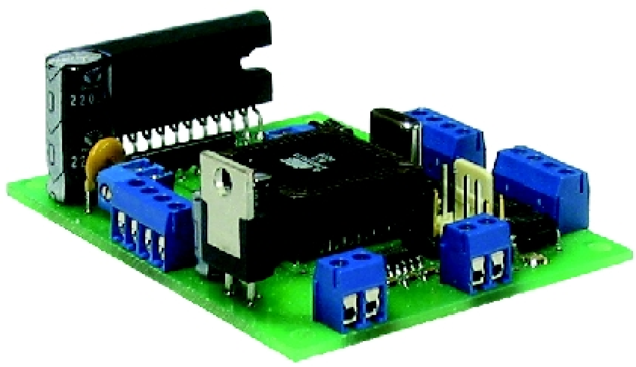
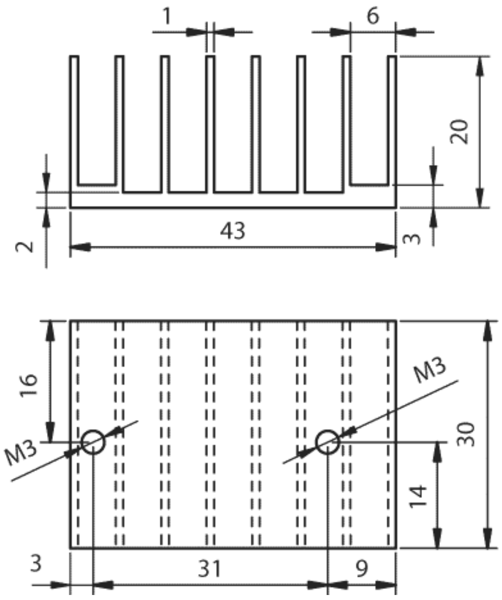


Figure 5. **8SMC1-RS232** Board photo



Dimensions and operating conditions for 8SMC1-RS232 are listed below:

Dimensions: 61.5 x 67 x 38 mm
Operating temperature range: 0 to 70 °C

Heatsink may be required to maintain temperature range.

Figure 6. Heatsink for 8SMC1-RS232

2.5 Wiring diagram

Wiring diagram for 8SMC1-RS232 is shown below:

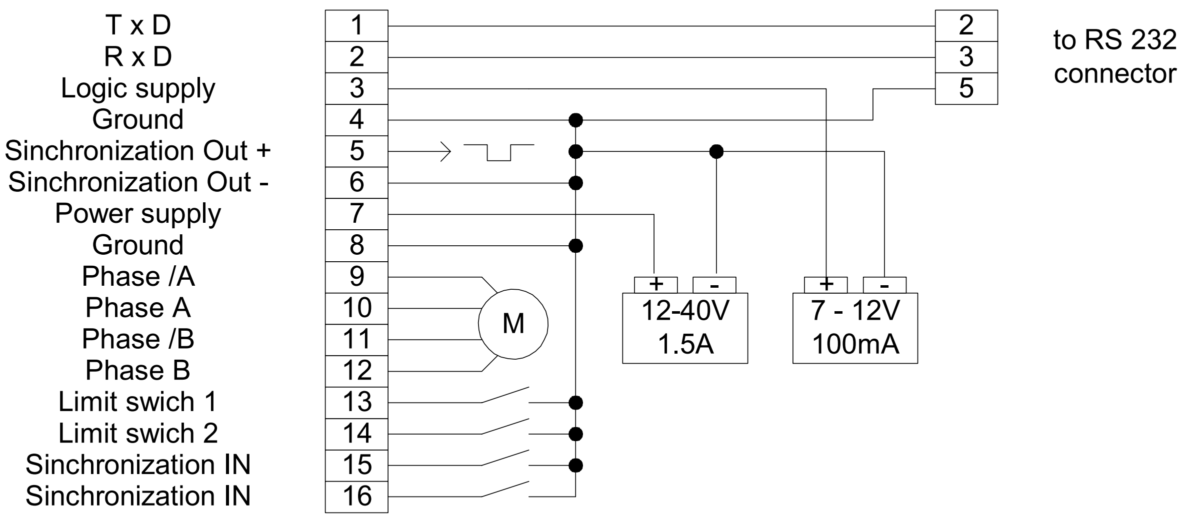


Figure 7. Wiring diagram

Terminal 9 might be used as additional power supply (5V, up to 50 mA) for external requirements such as full revolution sensor optocouple and others.

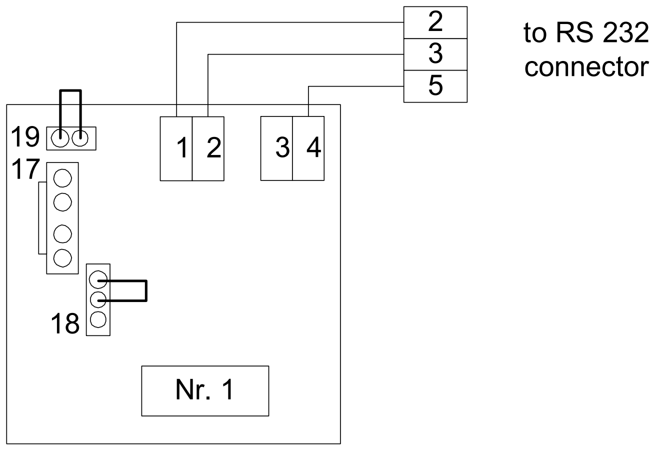


Figure 8. Connecting one controller to computer

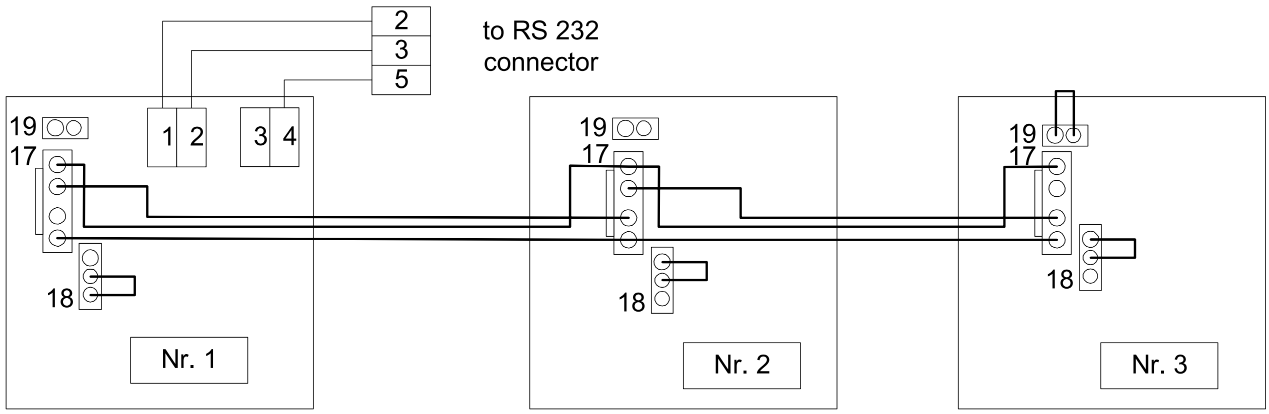


Figure 9. Connecting more then one controller to computer

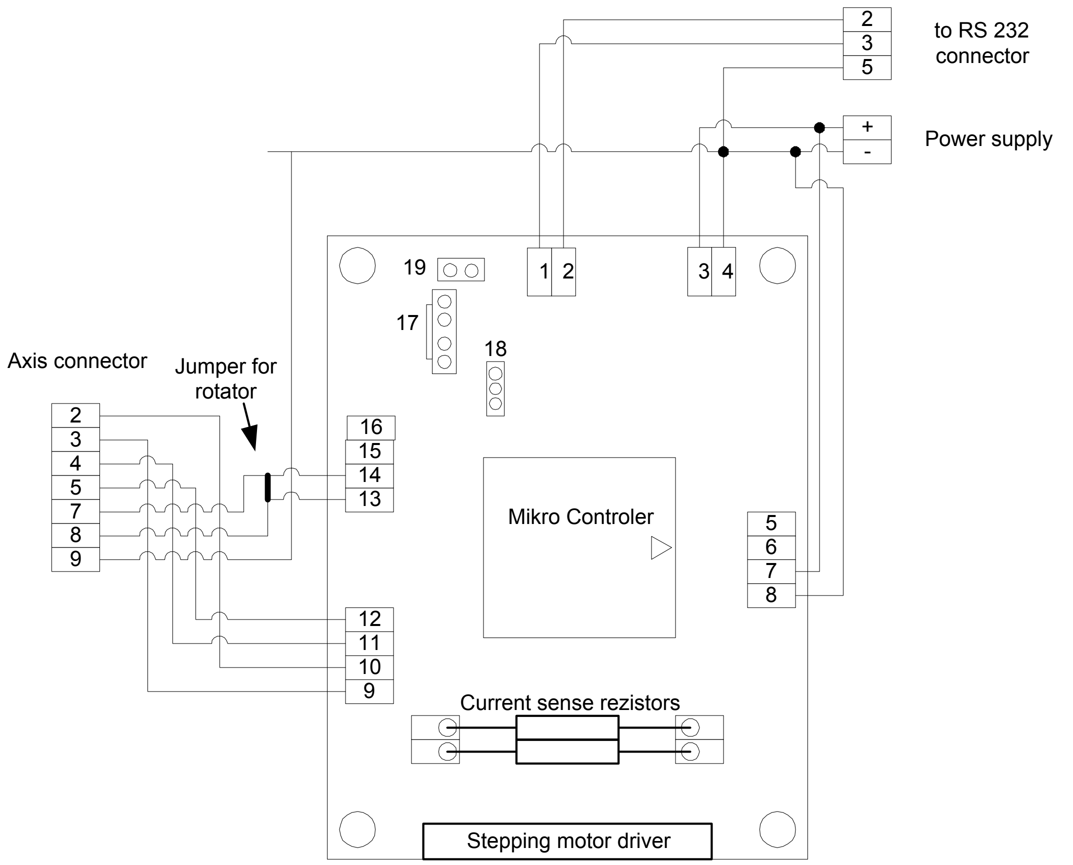


Figure 10. Connecting rotator.

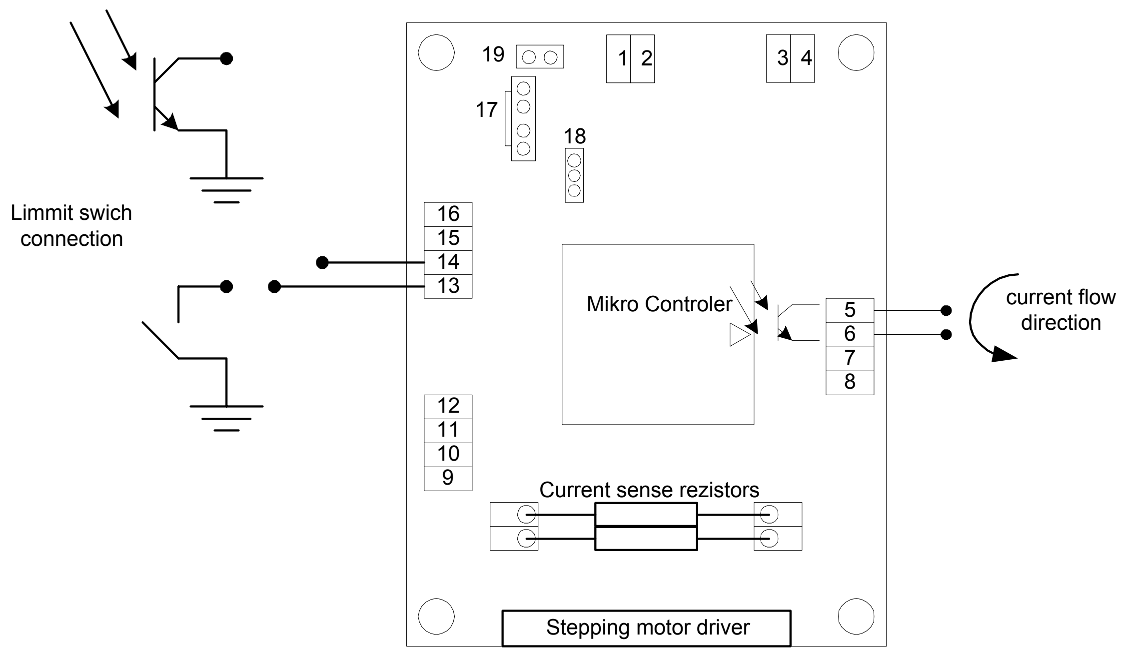


Figure 12. Limits and synchronization output.

2.6 Current sense resistors

For proper work of stepper motor it is necessary to choose a correct pair of current sense resistors. Rated resistance and power dissipation are calculated by the following way:

$$R = \frac{0.8}{I} \qquad P = I^2 \cdot R$$

where

I - rated current of stepper motor [A],

R - calculated resistance of current sense resistors [Ohm],

P - calculated power dissipation of current sense resistors [W].

In following table certain values of rated currents for stepper motor and resistance for current sense resistors are shown:

I, A	R, Ohm	P, W
0,1	8,2	0,08
0,16	5,1	0,13
0,21	3,9	0,17
0,24	3,3	0,19
0,3	2,7	0,24
0,4	2	0,32
0,5	1,6	0,4
0,62	1,3	0,5
0,8	1	0,64
1	0.8	0.8
1.33	0.6	1.1
1.6	0.5	1.3

Table 1. Current sense resistors. Power dissipation and current.

3 8SMC1-RS232 Command Protocol

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Motor Commands (X - axis)

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‘AXmn’<Enter> - motor on
‘AXmf’<Enter> - motor off
‘AXmb’<Enter> - stand by
‘AXms’<Enter> - stop

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Set Commands (X - axis)

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‘AXsl[0-F][0-F]’<Enter> - set start velocity   A2slF8<Enter>
‘AXsv[0-F][0-F]’<Enter> - set max velocity   A2sv80<Enter>
‘AXsa[0-F][0-F]’<Enter> - set acceleration   A2sa01<Enter>
‘AXsr[1-4]’<Enter> - set micro steps regime
‘AXsn[0-1]’<Enter> - limit switch on
‘AXsf[0-1]’<Enter> - limit switch off
‘AXsu[0-1]’<Enter> - synchronization(IN) on/off
‘AXso[0-1]’<Enter> - synchronization(OUT) on/off
‘AXsh’<0-1> - set rotation way
‘AXsx[r3][r2][r1]’<Enter> – set steps number
‘AXse[0-F][0-F]’<Enter> - time control   def. 12(hex) = 100uS max.
‘AXst[0-F] [0-F][0-F][0-F]’<Enter> - offset   A2st01A5<Enter>
‘AXsj[0-1] ’<Enter> - turn offset steps to: 0 – left; 1 – right side;
‘AXmr[0-1] ’<Enter> - reset to: 0 – left limit switch, 1 – right limit switch
‘AXsg[0-F] [0-F][0-F][0-F]’<Enter> - number of steps for periodical synchronization while running
A2sg0004<Enter>

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Move Commands (X - axis)

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‘AXgo’<Enter> – go

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Tell Commands (X - axis)

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‘AXtl’<Enter> - tell min velocity
‘AXtv’<Enter> - tell max velocity
‘AXta’<Enter> - tell acceleration
‘AXtr’<Enter> - tell micro steps regime
‘AXtp’<Enter> - tell counted steps
‘AXtc’<Enter> - tell version
‘AXtd’<Enter> - tell steps
‘AXti’<Enter> - tell offset steps
‘AXts’<Enter> - tell motor status, 0 – stand by, 1 – running, 2 – resetting to left, 3 – resetting to right{xx xx xx} – counted steps till limit switch after reset.
‘AXt1’<Enter> - tell limit switch 1 status
‘AXt2’<Enter> - tell limit switch 2 status
‘AXtg’<Enter> - tell synchronization steps while running

- **Period between steps**

  X - AXse[0-F][0-F], time controll. Period between steps. Def. = 10 uS

  (Xh)*0,27126736*2 = n uS

  (0x0012h+1)*0,27126736*2 = 10 uS

- **Rotations per second.**

  D1 - AXsl[0-F][0-F]’<Enter> - set start velocity (1 - 255)dec.
  D2 - AXse[0-F][0-F], time controll. Period between steps. (1 - 255)dec. Def. = 10 uS
  D3 - ‘AXsr[1-4]’<Enter> - set micro steps regime

  1 - 200steps
  2 - 400steps
  4 - 800steps
  8 - 1600steps

  prm/s= 1/(((D1*D2)*D3)/1000000)