U To Step Control V2.0 for Step Motors

U to Step Converter

If an actuator be activated by an external control voltage in the range of 0…10 VDC, in order to perform a linear or rotational movement, a step motor is the ideal solution to realize it. Due to of the magnetic holding torque of the step motor's rotor, in most cases the detection of the actor element's current position can be spared!
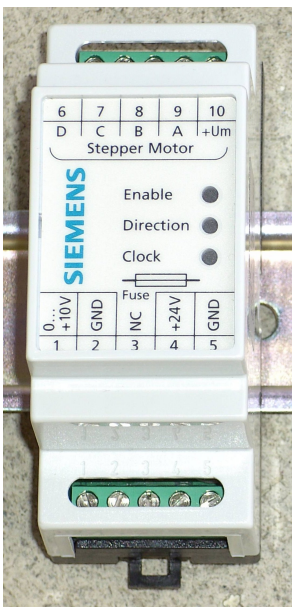

Abb. 1: Control Device on DIN-Rail

Through the bootloader integrated in the flash memory of the used microcontroller (MC), it is easy to handle replacing of new programs or program changes.

The input voltage will be filtered and limited before it is set directly to the MC's analog-to-digital converter. Via a suitable algorithm the control factor will be converted to a proportional burst output after digitization. An input voltage of 0 Volt equates to 0 pulses at the output and 10 Volt equates to 500 pulses at the output. The frequency remains constant but it also can be readjusted. Transacted to the step motor (48 steps per rotation) this means 10.416 rotations for a complete range! For the purpose of adjustment,

there are 3 LEDs provided to visualize the operating status when setting the actors:

- Device set to 24 V DC: green LED on
- Motor rotates: green LED flashes
- Motor energized: red LED on
- Motor rotates CW: yellow LED on

The electronic board is fixed in a plastic housing (UL tested) and is suitable to assemble on a DIN rail.

Application fields

- Valve control for gases or fluids etc.
- Flap control by step motors for the heating (and cooling) control system 'Siemens RLA162' [Ref.1]
- Controls linear step motors

Heating and Cooling Control

To operate a flap for a clima control (airflow): The flap can be operated in an angle between 0-90°. The flap's position correlates to the analog potential at screw terminal No. 1 against Gnd (No. 2). 2 ranges can be chosen: 0 to 10 or 2 to 10 Volt.

The flap is operated through a Tin-Can (claw pole) step motor which is equipped with a gear box which is reducing the rotor movement with 500 steps onto 90° flap rotation.

The analog input voltage is directly proportional to the flap's position.

If the signals RxD and TxD of the RS232 interface connected while booting up, the input voltage range from 2 to 10 Volt will be selected, otherwise it is 0 to 10 Volt. There is no feedback, accordingly the flap's current position must be known permanently and has to be recalculated precisely with each movement.

The Microcontroller does not know the flap's position when booting up. Thus the

flap will be rotated anti clockwise with each booting up procedure so that it is assured that it is located in zero-point position (mechanical stop).

If major changes at the analog input (screw-type terminal 1) occur, the motor will be controlled with a frequency of 340 Hz. If only small changes occur, the step motor is operated with 128 Hz. With very small changes the motor will not be activated, to avoid a so called "jittering" of the flap. If a very small change lasts for a longer time the coils will be disjuncted from the circuit.

If the analog input voltage in- or decreases very slowly, or if there is a tendency upwards or downwards apparent from the noise, then it will be readjusted ca. each 10 sec (several steps with a frequency of 60 Hz).

Technical Specifications

- Dim.: 52.6 x 34.8 x 86 mm (H x B x L)
- Power Supply: 24 V DC (+/- 10 %)
- Current max.: 0.115 A (Motor on)
- Current standby: 0.025 A (Motor off)
- Control Voltage: 0 …10 / 2 ...10 V DC
- Driver for Stepper: Uni-/Bipolar 2-Ph
- Max. Current Driver: 0.75 A/Ph
- Screw-type Terminals: 0.75 mm² / 2 A
- Accessories: RS-232 cable & SW

SAIA UBD20, 500 Ohm/Ph [Ref. 2]:

Cable Motor	Terminal
Green (2 x)	+Um (10)
Blue	A (9)
Black	B (8)
Yellow	C (7)
Red	D (6)

References:
[1] www.buildingtechnologies.siemens.com
[2] http://www.johnsonelectric.com