SA1755 Integration Guide

Product: SA1755 **Full name:** Stepper Actuator 1755 **Revision:** A

Guide focus	Companion module	Audience
Practical integration, wiring and first start	AA360 absolute magnetic encoder	Hobby users and custom device builders

1. Purpose and Scope

This guide explains how to integrate the SA1755 stepper actuator into a custom hobby device, including motor wiring, optional AA360 encoder wiring, first power-up checks, operating limits and typical failure modes.

SA1755 is a mechanical actuator module. It does not contain an internal stepper driver, controller or electrical protection circuits. The final performance and safety of the system therefore depend on the user's external electronics, software and mechanical implementation.

Important use class

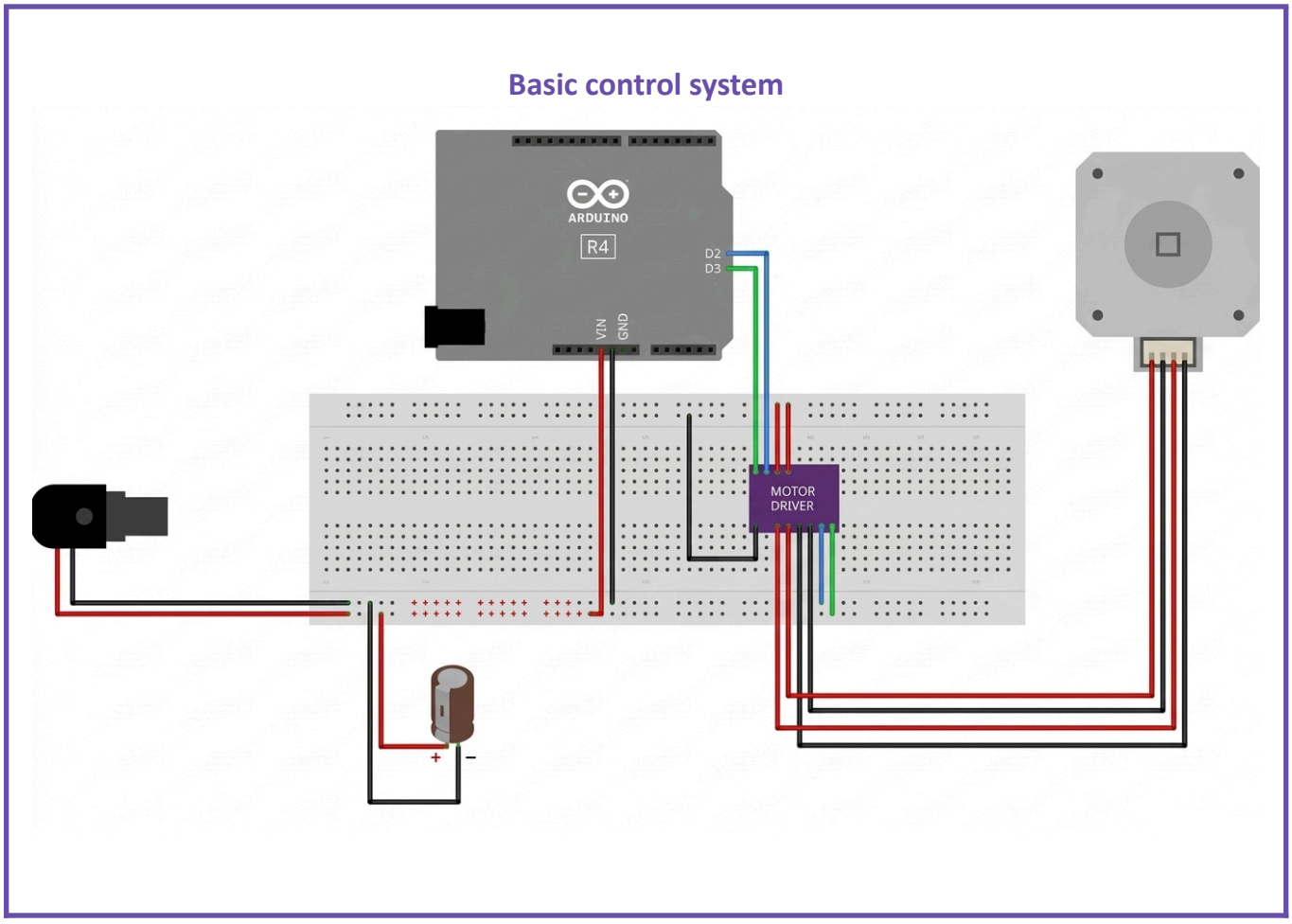
SA1755 is a hobby-grade technical component intended for custom integration.
It is not a certified industrial actuator and is not supplied as a safety-rated subsystem.

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2. System Overview

SA1755 combines a NEMA 17 stepper motor with a 9:1 reduction gearbox and is designed to work with a standard external bipolar stepper driver. For output-shaft feedback, the compatible module is the AA360 absolute magnetic encoder mounted inside of the actuator.

- Motor control is provided by the user through an external stepper driver.
- Encoder feedback is optional and is connected separately to the user controller.
- Absolute angle feedback removes the need for homing when the encoder is installed and referenced correctly.
- The actuator itself does not impose internal angle limits and supports continuous rotation.



3. What the User Must Provide

A complete SA1755-based axis requires external power electronics, a controller and an application-specific structure.

Required external components

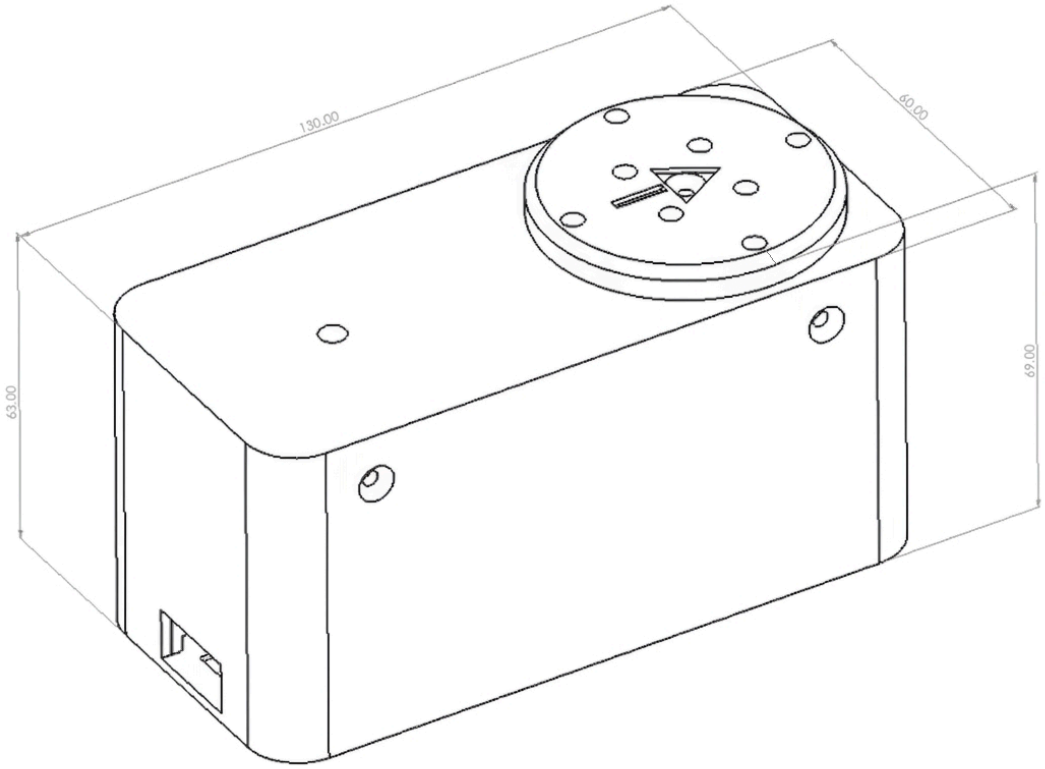
Parameter	Value
Stepper driver	External bipolar stepper driver suitable for the selected motor current and supply voltage.
Controller	Microcontroller, SBC or motion controller generating STEP/DIR or equivalent driver commands. Arduino recommended.
Power supply	Properly rated DC supply minimum 12V 1A. for the motor driver and separate 5V logic supply for the encoder if used.
Capacitor	~100uF on the power supply.
Software	Application-specific motion logic, safety behavior and optional feedback correction.
Cooling, if required	Recommended for continuous duty, high current settings or warm ambient conditions.

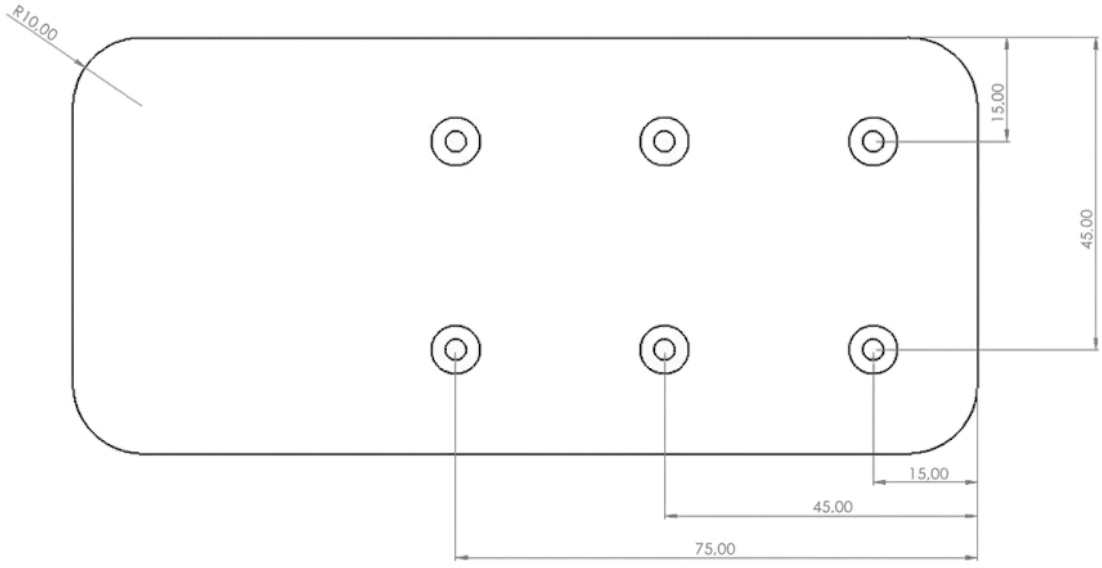
4. Mechanical Integration

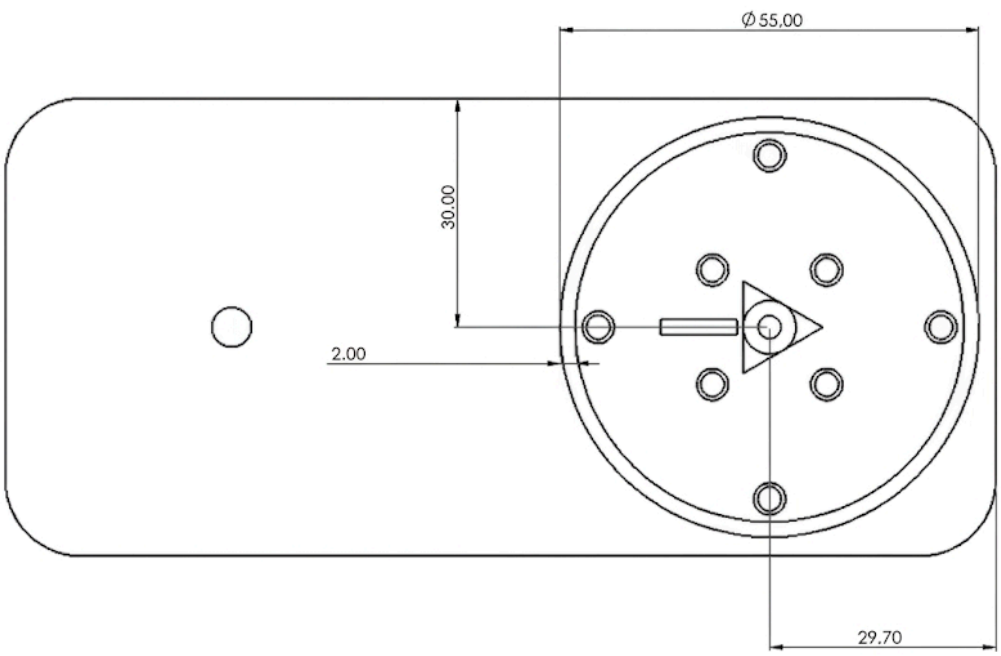
Mechanical integration requirements depend on the final application. SA1755 itself does not require a fixed mounting orientation, but the final assembly should keep the output shaft, load coupling and housing support aligned to minimize additional friction and side loading.

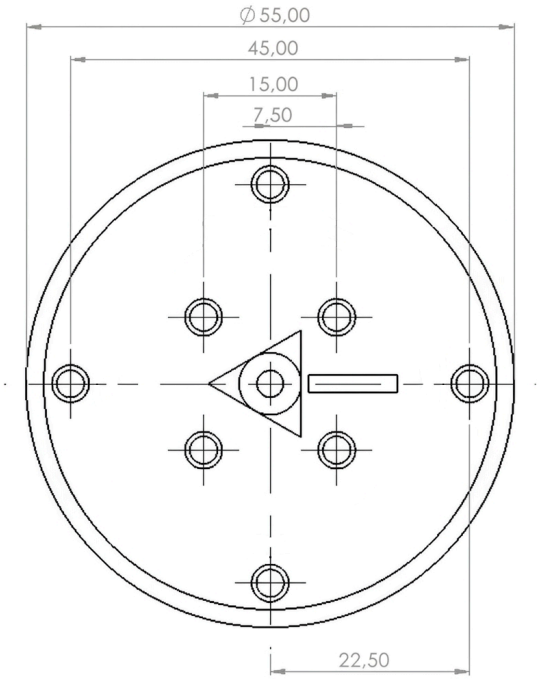
- Use a rigid mounting interface and avoid flexible brackets in torque-carrying joints.
- Do not use the output shaft as a structural support point for bending loads unless your external design explicitly accounts for them.
- For self-printed versions, gearbox friction and backlash may increase because of printer tolerances, material shrinkage and surface finish.
- Recommended DIY materials include PET, PCTG, PETG, PA, PC or other engineering materials with glass transition temperature above 60 C.

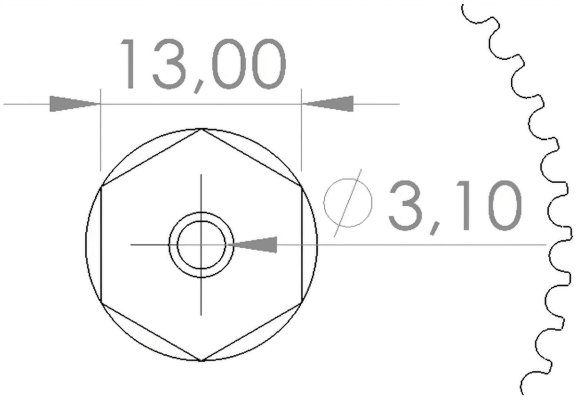
Mechanical drawing (SA1737, SA1755 is 91mm long)



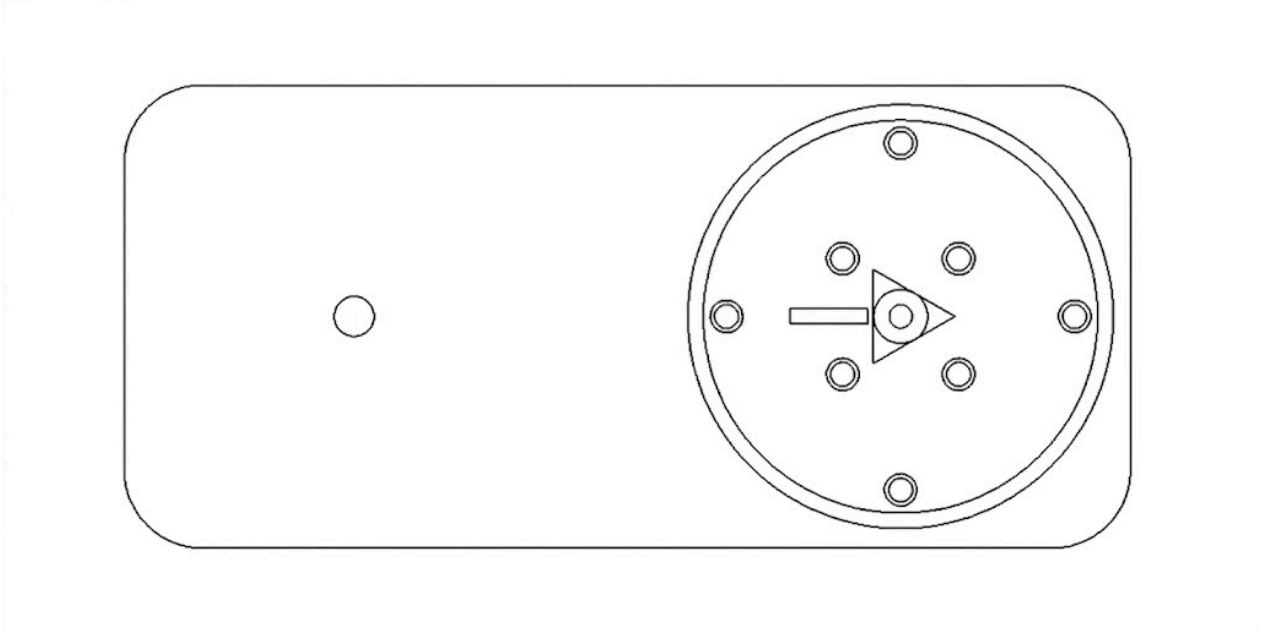



Ø 55,00
30.00
2.00
29.70


Ø 55,00
45,00
15,00
7,50
22,50


13,00
Ø 3,10

Zero-reference position

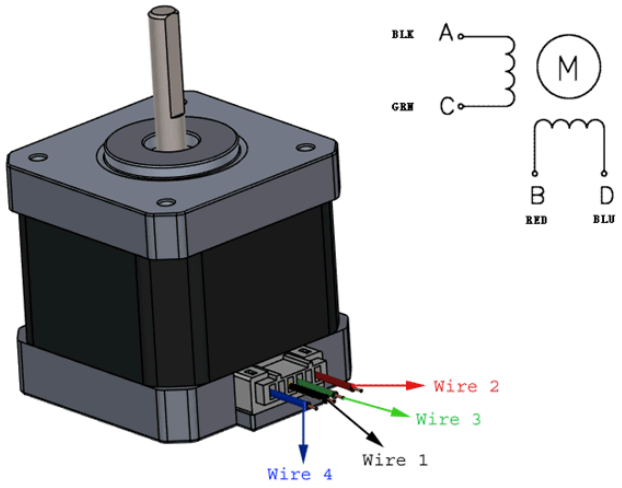


5. Electrical Integration

The motor and encoder are wired separately. The motor is connected directly to a user-supplied stepper driver. The encoder, if used, is powered separately and connected directly to the user controller.

Motor interface

Parameter	Value
Connector	JST 6-pin motor connector
Internal driver	None
Control method	Direct connection to an external bipolar stepper motor driver
Recommended drivers	TMC2209, TMC2208 and other standard stepper drivers

Parameter	Value
Phase labeling	

Encoder interface

Parameter	Value
Recommended companion module	AA360 absolute magnetic encoder
Encoder core IC	MT6701
Connector	4-pin Dupont in the default assembled version
Power supply	Separate from motor power
Default wire colors	Red - VCC, Black - GND, Green - SDA, White - SCL
Alternative outputs	Depending on the build, Analog or PWM may also be exposed

Encoder signal reference

Interface	Resolution	Implementation note
I2C	14-bit	Preferred digital interface for absolute angle readout and closed-loop correction.
PWM	12-bit	Useful when only timer capture is available on the host controller.
Analog	12-bit	Output is proportional to supply voltage; at 5 V supply the user-facing range is 0-5 V.

AA360 / MT6701 practical parameters

Parameter	Value
Encoder supply	3.3-5 V
Angle range	0-360 degrees, continuous rotation
Default I2C address	0x06 (7-bit)

Parameter	Value
Alternative programmable I2C address	0x46 (7-bit)
Angle registers	0x03 and 0x04
PWM output frequencies	Approximately 994.4 Hz or 497.2 Hz depending on configuration
Typical supply current	10 mA typ, 14 mA max
Zero reference	Defined mechanically; for SA1755 documentation it points toward the front of the actuator

No onboard protection

The actuator and encoder should be treated as direct electromechanical components. No reverse-polarity, overvoltage or wiring-fault protection should be assumed. Incorrect encoder wiring may permanently damage the encoder.

6. First Power-Up Procedure

The first power-up should be performed at reduced speed and with conservative current limits. This minimizes the risk of incorrect phase wiring, unexpected motion direction or thermal overload.

Step	Action
1. Verify mechanics	Check that the actuator can rotate freely and that the external load path does not bind the gearbox or shaft.
2. Set driver current	Configure the stepper driver for a conservative current before first energizing the motor.
3. Verify motor wiring	Confirm phase order on the motor connector or test at very low speed first.
4. Verify encoder wiring	Check VCC, GND, SDA and SCL before applying encoder power.
5. Start at low speed	Use low speed and low acceleration for the first motion test.
6. Confirm direction	Check whether the real direction matches the software direction expected by the application.
7. Confirm feedback	Read the encoder angle and verify that angle changes smoothly in the expected direction.
8. Raise limits gradually	Increase current, speed and acceleration only after confirming acceptable temperature rise.

7. Thermal and Operational Guidance

SA1755 supports continuous operation, but the final thermal behavior depends on the driver current, supply voltage, ambient temperature, enclosure airflow and the duty profile of the mechanism.

- Continuous operation is allowed when the thermal condition remains acceptable.
- Cooling is recommended during continuous duty, at elevated ambient temperature or when running relatively high current at lower voltage.
- Treat 70°C housing temperature as the practical upper recommendation for normal operation.
- If the actuator is used inside a closed enclosure, validate temperatures in the final assembly rather than in free air only.

8. Control Strategy Notes

SA1755 may be used in open-loop stepper mode or in a software-assisted closed-loop mode when combined with AA360. The correct strategy depends on the user application, not on the actuator itself.

- Open-loop stepper control is sufficient for many hobby mechanisms where occasional missed steps are acceptable.
- Closed-loop correction using the encoder is recommended when the task requires persistent output-angle awareness.
- The absolute encoder eliminates the need for homing when the reference orientation is preserved.
- The actuator has no intrinsic angle limits; any logical travel limit must be implemented by the user if the application requires it.

9. Typical Failure Modes and Troubleshooting

Symptom	Likely cause	Recommended action
Motor does not move	No driver output, wrong supply or disabled driver	Verify power, enable pins, current setting and control signals.
Motor vibrates but does not rotate	Incorrect phase order	Check phase pairing and repeat the low-speed test.
Direction is reversed	Software sign mismatch or wiring order	Invert direction in software or swap the relevant motor phase pairing.
Missed steps	Load too high, acceleration too aggressive or current too low	Reduce acceleration, increase driver current carefully or use feedback correction.
Excessive heating	Driver current too high, poor cooling or warm enclosure	Reduce current, improve cooling and re-check enclosure temperature.
No encoder response	Wrong wiring, wrong address or no logic supply	Verify VCC/GND and I2C wiring; check the expected slave address.
Unstable encoder reading	Wiring issue, poor signal integrity or mechanical misalignment	Inspect wiring, keep logic lines clean and verify encoder mounting alignment.
Encoder damaged after wiring	Reverse polarity or connection fault	Replace the encoder and correct the wiring before the next power-up.

10. Safety and Liability Notice

Handling warnings

Do not touch moving parts while the actuator is powered.
Disconnect power before rewiring the motor or encoder.
Do not use the product in contact with water unless the final machine provides external protection.
Do not use the product in medical, human-interactive, animal-interactive, life-critical or other safety-critical systems.

The user is solely responsible for validation, machine-level safety, environmental suitability and final application reliability. SA1755 is supplied as a hobby-use component with RoHS-oriented declaration only and without certified industrial, medical or functional-safety qualification.

11. Resources and Revision

Reference placeholders

Product page: https://www.spacedragon.online/SA1755
AA360 page: https://www.spacedragon.online/aa360
Revision A - Initial release