AG-540-B-DPS

Modulating electric actuator

JP Fluid Control®

Specifications

Model	AG-540-B-DPS
Movement time	13 s
Movement delay*	2 s
Voltage	24 AC/DC ± 10% (AC/DC automatically detected)
Supply frequency	50/60 Hz
Torque (Max.)	40 Nm
Current (Max.)	1.2 A
Control signal	0–10 V 2–10 V 4–20 mA
Output signal	0–10 V 2–10 V 4–20 mA
Resolution**	0.6°
Housing material	Powder coated aluminum
Seal material	NBR
Ambient temperate range	-10°C to 50°C
ISO 5211 flange	F03, F05, and F07 9-, 10-, and 12-mm thread depth respectively
Output shaft	14x14 star connection
Duty cycle	S2 30 min
Water resistance	IP67 weather proof rating for housing
Cable entry	2x 1/2” PF
Feedback	Two limit switches
Heater power	1 W
Outer dimensions	101.6 x 120.6 x 128.6 mm

*The delay between a change in input signal and the movement starting.

** The smallest possible movement the actuator can perform.

Safety Instructions

General safety Instructions

Please read the safety instructions carefully before installation, use or maintenance.

- The actuator only complies with protection class IP67 (according to IEC 60529), if the device is properly connected.
- This product is not a safety device and may not be used as such.
- Never put your hands/body parts or other objects into ports of mounted valves. The rotating motion can cause serious injuries or damages.
- Correct transport, proper storage and installation, and proper use and maintenance, are essential for reliable and error-free operation. The product may not function properly as a result of dirt, wear, damage (for example, by dropping) or improper use. Therefore, the product should not be used in applications where a malfunction can cause danger or damage.
- Check the compatibility of the valve, temperature and other operating conditions with the materials and specifications of the product. It is the responsibility of the user to select the right product for the application. Never exceed the limits for torque, temperature or voltage as indicated on the product and/or in the technical documentation.
- It is not allowed to change the construction of this device.
- Beware of electric shock, burnings or other injuries when working with electrical equipment. It is recommended to install the actuator in a dry environment. In moist environments, make sure that no moisture can penetrate the actuator. Make sure the actuator is not in contact with or in the vicinity of flammable materials. Ensure that the product is protected from frost. Frost may damage the product and/or block the moving parts, causing the electric ball valve to malfunction.
- Maintenance may only be performed when the system is not pressurized, electrically disconnected and cooled down.
- Turn off the power supply before performing any work on the actuator to prevent the risk of electrical shock and to prevent activation of the actuator.
- The product is only safe when properly installed and operated by qualified persons.
- Ensure a controlled commissioning after installation or maintenance.
- Improper installation can permanently damage the actuator or lead to dangerous situations

Compliance

The actuators are CE marked and comply with the EMC Directive (2014/30/EU), provided that the cables and connectors are properly connected.

Duty Cycle

The AG-5-series can be used for continuously for 30 minutes (S2 30 min according to IEC 60034-1), after this period the actuator must cool down to ambient temperature. High loads and long operating times may reduce the lifespan of the actuator.

Working Conditions

It is recommended to install the actuator in a dry and ventilated environment to prevent overheating and entry of moisture. Moreover, the ambient temperature should lie in the operating temperature range of -10 °C up to 50 °C. The actuator may only be used to control valves that require a maximum torque of 40Nm. Please note that the operating torque strongly depends on medium type, pressure, temperature and period of standstill. Break away torque can increase the maximum torque requirement!

Identification

The following figure shows an example of the type plate of the actuator. Observe the specifications and the connection diagram before using the product.

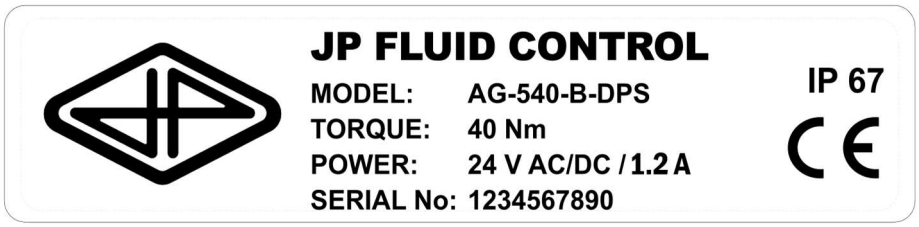

Figure 1 Example of specification sticker

Components

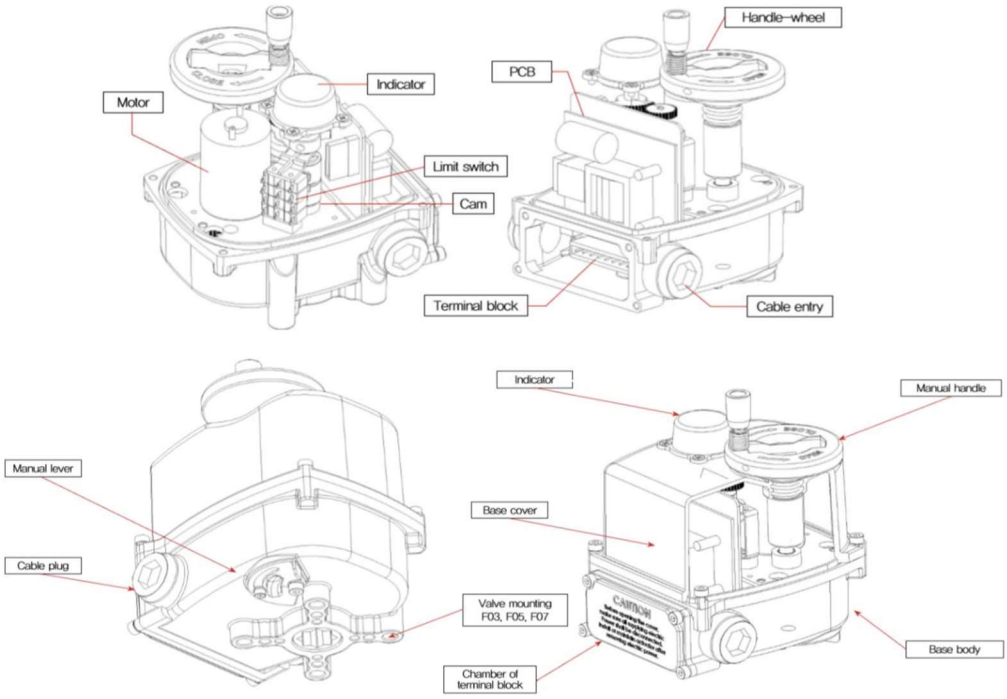

Figure 2 Components

Dimensions

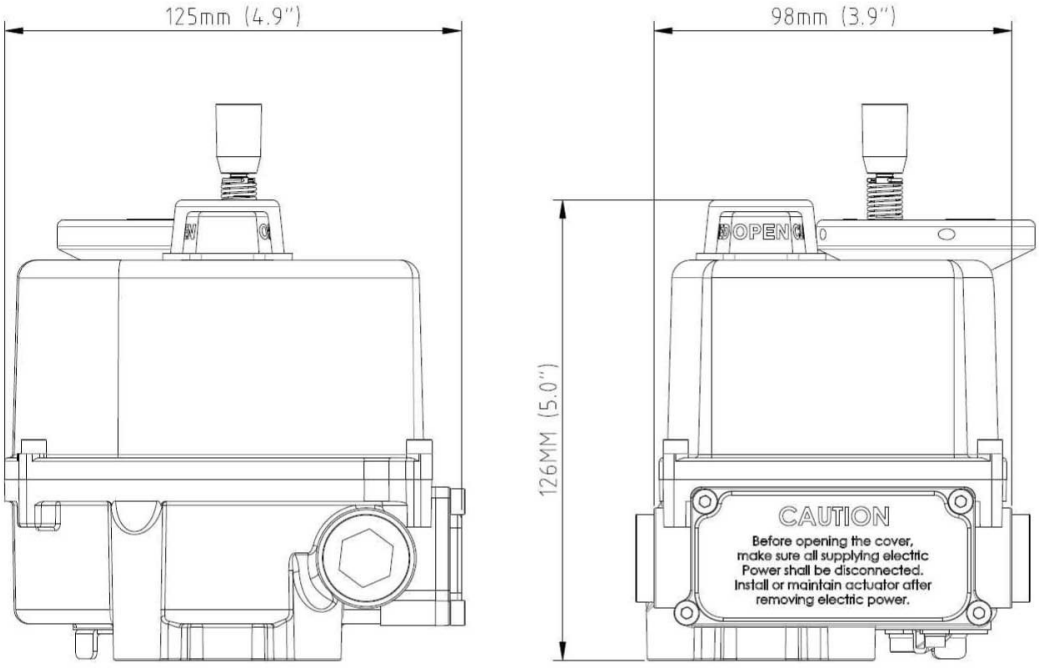

Figure 3 Outer dimension

Installation Guide

The following outlines the minimal steps required to install the valve actuator, assuming use with default settings (see Configuration to change these settings):

- Input signal: 4-20 mA.
- Output signal: 4-20 mA.
- Dead band: 0.4 mA.

Electrical connections

⚠ Do not use sharp objects while opening the box. Make sure the actuator is disconnected from any electricity before following the installation guide.

1. Carefully open and unpack the box.
2. Loosen the four captive bolts of the terminal block chamber and remove the blind stops on the side where cables will enter.

Figure 4 Removal of terminal block plate

Figure 5 Removal of blind stops

3. Remove the terminal block from the terminal block chamber by hand.

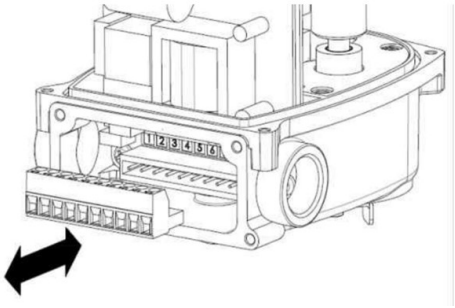

Figure 6 Removal of terminal block chamber

4. Insert a suitable cable through the cable holes.
5. Connect the wires to the terminal block according to the Figure below.

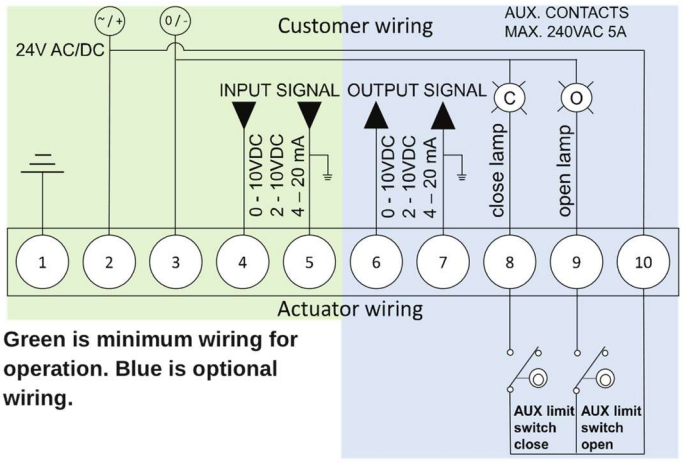

Figure 7 Electrical wiring diagram

⚠ Do not use bundled up cables or cables that surpass 10 m in length to prevent voltage drop and induction effects. Always connect to ground.

Limit Switch Feedback (optional)

⚠ Always apply a load (max. 5A) in the feedback circuit to prevent permanent damage. Always apply the correct polarity/phasing.
The limit switches share a common source, do not use different power supplies on both limit switches at the same time.
Terminal 8 & 9 must have the exact same polarity, voltage & frequency when both are being used.

⚠ The MAX. limit switch voltage is 240V

6. The state of the limit switch can be measured on terminal 8 (closed) and 9 (open) when power is supplied to terminal 10 (see Figure 7).

Continuous feedback (optional)

⚠ Never apply a voltage to terminal 6 and 7, applying a voltage to these terminals can result in permanent damage to the actuator.

7. The position of the actuator can be measured by the terminal pairs 6 & 7. This will give a signal of 4-20 mA, alternatively a signal of 0-10 V or 2-10 V can be generated *(see Configuration).

Calibration

Calibration is recommended after installing the actuator on the valve to define the open and closed positions, minimize hunting, and improve resolution.

⚠ Performing calibration can only be done by a certified service technician as it is done on a live PCB.

8. Mount the actuator on the valve as described in step 15.
9. Remove the top cover (4 captive bolts).

Figure 8 Removal of top cover

10. Make sure DIP switch 1 is off. (See Figure 9).
11. Turn on the power supply.
12. Press and hold the AT button for 3 seconds.

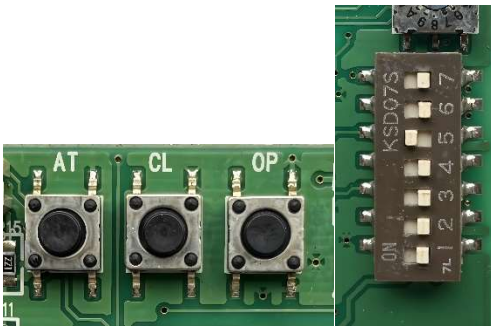

Figure 9 PCB buttons (left) and DIP switches (right)

13. Wait for the automatic calibration program to complete. The actuator will cycle three times within the 0–10% range (closed position) and three times within the 90–100% range (open position).

14. Remount the Terminal Block chamber cover and the housing cover with the Captive Bolts.

Installing on Valve

15. Align the position of the valve and actuator, make sure both are in either the open or closed position. The actuator may be installed in any position, but it is recommended to install the actuator in a vertical position, with the position indicator facing upwards. This reduces the probability of moisture entering the actuator. When the electric ball valve is mounted at an angle, it is recommended to deviate maximally 90° from the vertical position. Ensure that drops cannot slip along the cable and enter the actuator. See figure below for a visual explanation.

    Mount the actuator to the valve with the appropriate flange.

    The actuator can be mounted to valves with a flange according to ISO 5211 type F03, F05 or F07. The shaft is square 14x14mm, for valves with a shaft of 9x9mm or 11x11mm, an enclosed adapter can be used. The valve must be fixed to the actuator by four bolts of M5 (type F03), M6 (type F05) or M8 (type F07).

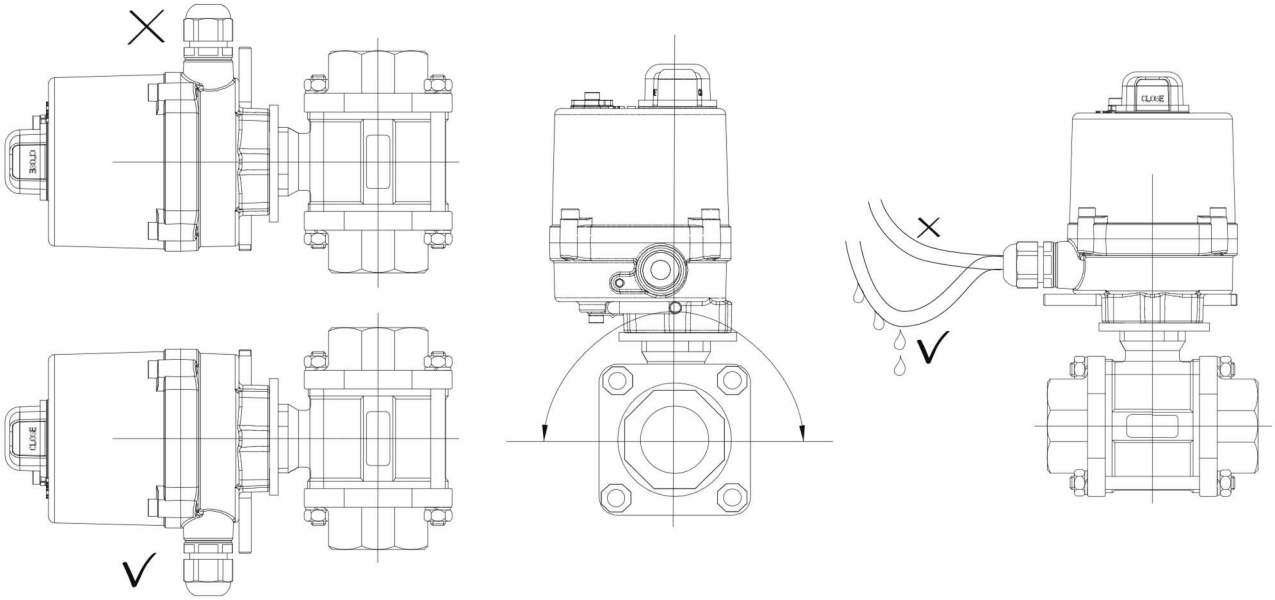

Figure 10 Mounting position

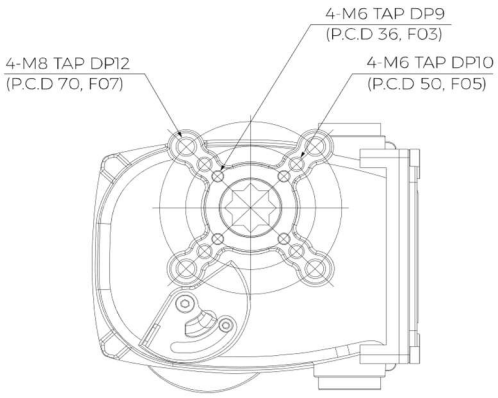

Figure 11 ISO 5212 mounting

Configuration

DIP switches

The DIP switches can be used to define the actuator settings according to the table below. MANUAL BUTTONS mode allows the user to control to actuator using the CL (close) and OP (open) buttons on the PCB when powered. AUTO mode is used for calibration, see Installation guide above. The FAIL mode described what the actuator will do when an error occurs.

MODE	INPUT		OUTPUT			FAIL	
SWITCH	1	2	3	4	5	6	7
MANUAL BUTTONS	ON	OFF					
AUTO	OFF	ON					
4-20 mA	OFF	OFF	OFF	OFF	ON		
2-10 VDC	OFF	ON	OFF	OFF	ON		
0-10 VDC	ON	ON	ON	ON	OFF		
STOP						OFF	OFF
OPEN						ON	OFF
CLOSE						OFF	ON
DEFAULT	OFF	OFF	OFF	OFF	ON	OFF	OFF

Span and Zero

With the standard factory setting calibration is not needed, when using different output settings calibration of the output signal might be necessary. To calibrate the SPAN and ZERO follow these steps:

⚠ Performing calibration can only be done by a certified service technician as it is done on a live PCB.

1. Remove the top cover (4 captive bolts).

2. Close the actuator using the input signal (4mA, 0V or 2V depending on input setting).
3. Use the ZERO switch on the PCB board to calibrate the output value to correspond exactly to the input value. Measure the output signal on pins 6 and 7 (Use of a multimeter is recommended)

Figure 12 SPAN and ZERO buttons

4. Open the actuator using the input signal (20 mA or 10 V depending on input setting).
5. Use the SPAN switch on the PCB board to calibrate the output value to correspond exactly to the input value. (Use of a multimeter is recommended)
6. Remount the Terminal Block chamber cover and the housing cover with the Captive Bolts.

Deadband

The deadband setting determines the step size required to move the actuator. Step size at setting #0 is 0.2 mA, every step bigger increases this by 0.1 mA. The default setting is #2 (so a step size of 0.4mA).

If the actuator is hunting (moving around the required position when it should not be moving) the dead band setting is too low.

To change the deadband, access the PCB by taking of the top cover (see Span and zero above) and use a flat screwdriver to rotate the potentiometer shown in figure 13.

Figure 13 Deadband potentiometer on PCB

LED Status

The status of the actuator is displayed by the LEDs on the PCB. The tables below show the different possible states.

STATUS	FT (red)	CL (yellow)	OP (green)	AT (red)
NORMAL OPERATION	ON	OFF	OFF	ON
CALIBRATION ACTIVE	ON	ON	ON	
OPENING			ON	
CLOSING		ON		

Figure 14 LEDs on PCB

ERROR	LED	STATUS
Potentiometer fault	LED 1 & LED 2	ON
	LED 3 & LED 4	Blink every 05 sec
Broken input signal	LED1 & LED2	ON

Manual Mode

Manual mode can be used to manually move the actuator without electrical power. To use, follow these steps.

⚠ Only use manual mode when the actuator is not electrically powered.

1. Shift the lever on the bottom of the actuator from “auto” to “manual” to set the actuator to manual override, a small degree of rotation of the lever wheel might be necessary to shift the lever.
2. Fold the lever in the wheel up and rotate until the actuator has reached the desired position.

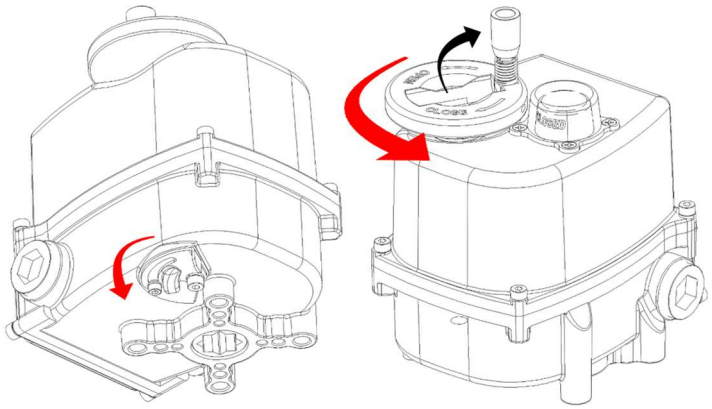

Figure 15 Manual mode operation

⚠ Make sure the lever wheel is disconnected from the gears before electrically operating the actuator (set the lever to "auto" position).

3. When finished, shift the bottom lever back to the "auto" position and wiggle the lever wheel until a click is heard, this is to couple the gears to the motor.

   Test to see if the gear is re-coupled to the motor by turning the lever wheel and inspecting the valve position. If the valve does not move the gears are re-connected to the motor. Fold the gripping rod back in the lever wheel.

Limit Switch Adjustment

The limit switch cams can be adjusted to the desired angle. The standard setting is such that ball valves are fully closed or fully opened. For special applications the cam position may be altered by loosening the locking bolt (6), adjusting the cam to the right angle and locking the locking bolt again.

⚠ The angle may be altered max. 10° since the actuator has a limited range.

Nr.	COMPONENT
1.	Close limit switch
2.	Auxiliary close limit switch
3.	Auxiliary open limit switch
4.	Open limit switch
5.	Close limit switch cam
6.	Locking M4 bolt
7.	Open limit switch cam

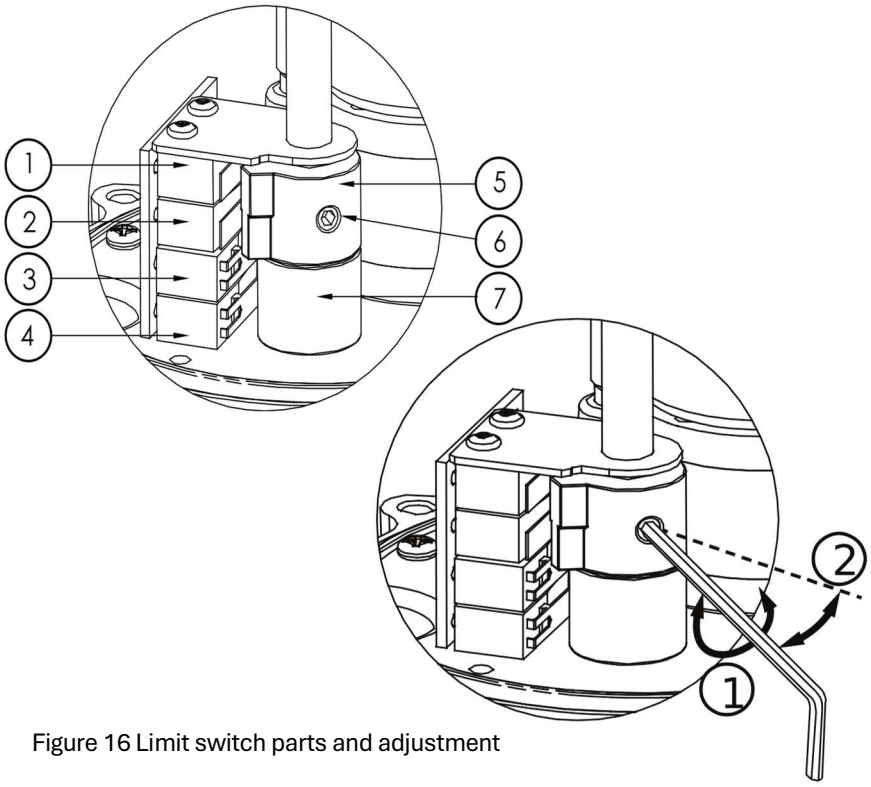

Figure 16 Limit switch parts and adjustment

Disposal

The removal of the product should be performed in accordance with the applicable laws. Keep in mind the media that are still present in the valve.