

GAS24-450 Series – 450 lb-in (2000 Nm) Electric Actuator

IOM Manual



Table of Contents

GAS24-450 Series - Installation, Operation and Maintenance Manual

| | |
|--------------------------------|------|
| Technical Specifications | 2 |
| Features/Operation | 3-5 |
| Settings | 6, 7 |
| Wiring/Dimensions | 8 |

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| Technical Specifications - Actuator | | |
|--|---|---|
| Spring Return | GASRE24-450 | On/Off, Floating and Modulating, Shaft Normally Retracted |
| | GASEX24-450 | On/Off, Floating and Modulating, Shaft Normally Extended |
| Power Requirements | On/Off, Floating and Modulating | 24 VAC (±20%) at 50/60 Hz or 24 VDC (±15%) |
| Positioner ¹ | Control Signal 1 | 0 to 10 V, Ri > 100 kΩ |
| | Control Signal 2 | 4 to 20 mA, Ri = 50Ω |
| | Position Feedback Signal | 0 to 10 V, Load >10 kΩ |
| Action | Direct or Reverse Acting | |
| Switching Range | 300 mv | |
| Power Consumption ² | 7.5W, 20VA | |
| Force | 450 lbs. (2,000 N) Power Stroke and Spring Stroke | |
| Stroke | 0" to 1.93" (0-49mm) | |
| Max. Temperature of Media ³ | 248°F (120°C) | |
| Ambient Conditions | Temperature | 14°F to 131°F (-10° to 55°C) |
| | Humidity | 0 to 95% RH without condensation |
| | Storage Temperature | -4°F to 158°F (-20° to 70°C) |
| Level of Protection | IP 66. Not intended for outdoor use without additional protection. | |
| Enclosure | Self-extinguishing plastic | |
| Gear Materials | Gears & Gearbox | Steel |
| | Mounting Column | Stainless Steel |
| | Mounting Bracket | Cast Light Alloy |
| Electrical Connection | 13 AWG (2.5 mm ²) with screw terminals. Three knock-out cable entries for M20×1.5 (2×) and M16×1.5 | |
| Motor Run Time sec. per in. (mm) | 51 (2), 102 (4), 153 (6), DIP Switch Adjustable | |
| Spring Run Time ⁴ | 15... 30 seconds | |
| Number of Spring Returns | > 40,000 | |
| Response Time - 3-Point | 200 ms | |
| Weights | 9.1 lbs. (4.1 kg) | |
| Agency Certifications | CE, UL Listed - Temperature-Indicating and Regulating Equipment, XAPX, XAPX7. File E366456 | |
| Warranty | 5 Years limited from time of shipment. | |

¹ Also for On/Off (2-point) or Floating (3 point) depending on the connection for 24V-

² Design the transformers for this value, otherwise functional faults may occur.

³ An intermediate piece is required for media temperatures between 248°F (120°C) and 464°F (240°C)

⁴ The return time corresponds to a stroke of 0.55 in. (14 mm) to 1.58 in. (40 mm) and does not depend on the set run time.

Disclaimer - The performance specifications are nominal and conform to acceptable industry standards.

For application at conditions beyond these specifications consult the local Bray office.

Bray, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



GAS24-450 Series — IOM Manual

Spring Return — 450 lb-in. (2000Nm)

24V, On/Off, Floating and Modulating Automatic adaptation to valve, precision control and high energy efficiency with minimal operating noise.

Features

- Actuator with spring return action and pushing force of 450 lbs. (2000Nm), in 'normally retracted' or 'normally extended' versions
- DC motor with electronic control unit and electronic load- dependent cut-off
- Automatic detection of control signal applied (modulating or floating), display via 2 LEDs
- The type of characteristic curve (linear, quadratic or equal percentage) can be adjusted in the drive
- Independent adaptation to valve stroke between 0.31 in.(8 mm) and 1.57 in.(40 mm), captive even if the power is turned off
- Direction of travel can be selected via screw terminals when making electrical connection or remotely
- Hand crank for external manual adjustment with motor cut-off and as trip for re-calibration
- Easy assembly with valve, spindle connection takes place automatically after application of control voltage
- Many adaptor kits allow assembly on third-party valves

Technical Description

- Two-part housing made of self-extinguishing red plastic and sealing to IP66 (equivalent to NEMA 4) protection class
- Maintenance-free gearbox in sintered steel, gearbox base-plate in steel
- Spring assembly in Stainless Steel
- Patented drive-valve coupling
- Mounting column made of stainless steel and mounting bracket for fitting valve made of cast light alloy
- Electrical connections 13 AWG (max. 2.5 mm²) with screw terminals
- Three knock-out cable entries for M20×1.5 (2×) and M16×1.5
- Fitting position: vertical to horizontal, but not upside down

Accessories

Auxillary Switches

0372333 001 Continuously adjustable, min. 100 mA and 12 V, additional load 6(2) A

0372333 002 Gold-plated contacts, from 1 mA and up to 30 V, further range 3(1) A

Adaptor kits for Industrial Globe Valves

GA-MTG-01 DG250-x and DG3-x

GA-MTG-02 DG4-x, DG5-x and DG6-x

Fittings

0386263 001 Screwed cable fitting M16 X 1.5

0386263 002 Screwed cable fitting M20 X 1.5

High Media Temperature Kit

0372336 240 Adaptor required for medium temperatures between 266°F (130°C) and 464°F (240°C)

Operation

After a new start, up to 45 s of waiting time will pass before the drive is available again. Depending on the type of connection (see the wiring diagram), the device can be used as a modulating drive (0...10 V and/or 4...20 mA), a On/Off (2-point) drive (extend/retract) or a Floating (3-point) drive (extend/stop/retract). The run time of the drive can be set according to the specific requirements, using switches S1 and S2. Switches S3 and S4 are used to configure the characteristic curve (equal percentage, linear or quadratic). The external hand crank allows you to adjust the position manually. When the hand crank is folded out, the motor is switched off. After the hand crank is folded back, the spring function is active again and the setpoint position is adopted again (without calibration). If the hand crank is unfolded, the drive stays in this position.

Calibration and feedback signal

The drive calibrates itself automatically, whether it is used in a modulating, On/Off (2-point) or Floating (3-point) mode. Voltage needs to be applied to terminal 21. As soon as voltage is applied to either terminals 2a or 2b for the first time and the waiting period (both LEDs green) of approximately 45 seconds has elapsed, the drive moves to the lower limit stop on the valve, thus enabling automatic connection with the valve spindle. Then it moves to the upper limit stop, and the value is recorded and saved with the help of a path measurement system.



Re-Calibration

To re-calibrate, voltage needs to be applied to either terminal 2a or 2b and the voltage signal input circuit needs to be completed by installing a jumper between terminals 3u and 1. To trigger re-calibration, fold the hand crank out and back in again twice within 4 seconds. Each time the hand crank is folded out rotate it slightly in either direction until a clicking sound is heard. Both the LEDs will then flash red.

During re-calibration, the feedback signal is inactive, or it corresponds to a value of "0". Re-calibration uses the shortest run time. The re-calibration is only valid once the entire procedure has been completed. Folding the hand crank out again will interrupt the procedure.

If the valve drive detects a blockage, it will report this by setting the feedback signal to 0 V after approx. 90 s. However, the drive will try to overcome the blockage during this time. If it is possible to overcome the blockage, the normal control function is activated again and the feedback signal is restored.

Connection as a On/Off (2-point) Actuator

This activation can take place via two cables. Voltage is applied to terminal 2a. Applying the voltage to terminal 2b extends the actuator shaft. After this voltage has been switched off from 2b, the drive moves to the opposite end position. The electronic motor switch-off responds in the end positions (valve limit stop, or when maximum stroke is reached) or in case of overload (no limit switches).

The coding switch can be used to set the run times. The characteristic curve cannot be selected in this case (resulting in the characteristic curve for the valve). The feedback signal is active as long as calibration was performed and a jumper is installed between terminals 3u and 1. Terminal 3i must not be connected.

Connection as a Floating (3-point) Actuator

Applying voltage to terminal 2a or 2b makes it possible to move the valve to any desired position. If voltage is applied to terminal 2b, the actuator shaft extends. The shaft retracts when voltage is applied to terminal 2a. In the end positions (at the valve stop, or when the maximum stroke is reached) or in case of an over-load, the electronic motor switch-off responds (no limit switches). The direction of the stroke can be changed by transposing the connections.

The coding switch is used to set the run times. In this case, the characteristic curve cannot be selected (resulting in the characteristic curve for the valve). The feedback signal is active as long as calibration was performed and a jumper is installed between terminals 3u and 1. Terminal 3i must not be connected.

Modulating Actuator (0...10 V and/or 4...20 mA)

The built-in positioner controls the drive depending on the controller input signal y . The input signal used is a voltage signal (0...10 V) at terminal 3u, or a current signal at terminal 3i. If an input signal is present at both terminals (3u (0...10 V) and 3i (4...20 mA)) simultaneously, the input with the higher value takes priority.

Mode of action 1 (apply voltage to internal connection 2a): As the input signal increases, the valve shaft extends.

Mode of action 2 (apply voltage to internal connection 2b): As the input signal increases, the valve shaft retracts.

The starting point and the control span are fixed. After the voltage supply is applied and after calibration, the drive moves to each valve stroke between 0% and 100%, depending on the input signal. The electronics and the path measurement system ensure that no stroke is lost, and the drive does not require re-calibration at intervals. When the end positions are reached, the position is checked, corrected as necessary and stored again. This ensures parallel running of several drives of the same type. Feedback signal $y_0 = 0...10$ V corresponds to the effective valve extension of 0 to 100%.

The coding switch can be used to set the characteristic for the valve. Equal-percentage and square characteristics can only be produced if the device is used as a proportional-action drive. Further switches can be used to select the run-times (can be used for the On/Off (2-point), Floating (3-point) or proportional functions).



Calibration and feedback signal - Continued

The control signal and the feedback signal are adjusted to this effective stroke. After an interruption to the voltage or a spring return action, no re-calibration is performed and the values are saved. Calibration must be performed in order to utilize the feedback signal when On/Off (2-point) or Floating (3-point) control is required. Terminal 44 is 0-10 VDC feedback. The feedback signal always increases as the shaft extends.

Re-Calibration

To re-calibrate, voltage needs to be applied to either terminals 2a or 2b and terminal 21. Prior to re-calibration if power has been disconnected or terminal 21 has lost power there will be a waiting period (both LEDs flash green) of approximately 45 seconds. To trigger re-calibration, fold the hand crank out and back in again twice within 4 seconds. Each time the hand crank is folded out rotate it slightly in either direction until a clicking sound is heard. Both the LEDs will then flash red.

During re-calibration, the feedback signal is inactive, or it corresponds to a value of "0". Re-calibration uses the shortest run time. The re-calibration is only valid once the entire procedure has been completed. Folding the hand crank out again will interrupt the procedure. If the actuator detects a blockage, it will report this by setting the feedback signal to 0 V after approx. 90's. However, the drive will try to overcome the blockage during this time. If it is possible to overcome the blockage, the normal control function is activated again and the feedback signal is restored.

Spring Return

If the voltage supply fails or is switched off, or if a terminal 21 is disconnected, the brushless DC motor releases the gear and the drive is moved into the respective end position (depending on the design version) by the pre-tensioned spring. As this happens, the control function of the drive is disabled for approximately 45 seconds (both LEDs green) so that the end position can be reached in every case. The reset speed is controlled with the help of the motor so that there are no pressure surges in the line. The brushless DC motor has three functions: as a magnet to hold the position, as a brake (by acting as a generator) and as a motor for the control function. After a spring return function, the drive does not re-calibrate itself.

Connection as a On/Off (2-point) Actuator

This activation can take place via two cables. Voltage is applied to terminals 2a and 21. Applying the voltage (24 V) to terminal 2b causes the actuator shaft to extend. After this voltage has been switched off, the drive moves to the opposite end position. The electronic motor switch-off responds in the end positions (valve limit stop, or when maximum stroke is reached) or in case of overload (no limit switches).

The coding switch can be used to set the run times. The characteristic curve cannot be selected in this case (resulting in the characteristic curve for the valve). The feedback signal is active as long as the calibration was performed. Terminals 3i, 3u must not be connected.

Connection as a Floating (3-point) Actuator

Applying voltage to terminals 21, 2a or 2b makes it possible to move the valve to any desired position. If voltage is applied to 2b, the actuator shaft extends. The shaft retracts when voltage is applied terminal 2a.

In the end positions (at the valve stop, or when the maximum stroke is reached) or in case of an overload, the electronic motor switch-off responds (no limit switches). The direction of the stroke can be changed by transposing the connections. The coding switch is used to set the run times. In this case, the characteristic curve cannot be selected (resulting in the characteristic curve for the valve). The feedback signal is active as long as the calibration was performed. Terminals 3i, 3u must not be connected.

Modulating Actuator (0...10 V and/or 4...20 mA)

The built-in positioner controls the drive depending on the controller input signal y.

The input signal used is a voltage signal (0...10 V) at terminal 3u, or a current signal at terminal 3i. If an input signal is present at both terminals (3u (0...10 V) and 3i (4...20 mA)) simultaneously, the input with the higher value takes priority.

Apply voltage to terminal 21.

Mode of action 1 (apply voltage to internal connection 2a): As the input signal increases, the valve shaft extends.

Mode of action 2 (apply voltage to internal connection 2b): As the input signal increases, the valve shaft retracts.

The starting point and the control span are fixed. After the voltage supply is applied and after calibration, the drive moves to each valve stroke between 0% and 100%, depending on the input signal. The electronics and the path measurement system ensure that no stroke is lost, and the drive does not require re-calibration at intervals. When the end positions are reached, the position is checked, corrected as necessary and stored again. This ensures parallel running of several drives of the same type. Feedback signal y0 = 0...10 V corresponds to the effective valve extension of 0 to 100%.



GAS - Curve Characteristic Switch Settings

| DIP Switch Position | Characteristic Curve for Actuator Drive | | Retract/ Extend Position |
|---------------------|---|----------------------|--------------------------|
| | Wired to Terminal 2b | Wired to Terminal 2a | |
| | | | <p>RETRACTED</p> |
| | | | |
| | | | <p>EXTENDED</p> |
| | | | |

Note: When using a 4-20 mA control signal, the actuator drive's characteristic curves remain unchanged. When wired for 4-20 mA control...
 - 4 mA command results in the same drive response as 0 VDC
 - 20 mA command results in the same drive response as 10 VDC

GAS - Default Assembly Settings

| Valve | Desired Characteristic Curve | Switch Coding | Characteristic Curve for Valve | Characteristic Curve for Drive | Effect on Valve |
|-------------|------------------------------|---------------|--------------------------------|--------------------------------|-----------------|
| Globe Valve | Equal Percentage | | | | |
| PIC Valve | Equal Percentage | | | | |

Note: the graphs shown for the default assembly settings apply only to the valves that close in the down (extended) position and open in the up (retracted) position.

Model Number Selection Chart

| Model Number | Force in. lbs. | Voltage | Control Signal | Auxiliary Switches | High Temperature Kit |
|--------------|----------------|---------|----------------------------------|--------------------|----------------------|
| GA24-562 | 562 | 24 VAC | On/Off Floating Modulating | -A | -HT |



GAS - Curve Characteristic Switch Settings

SSM Valve Stroke Times GAS Total Stroke = 1.93" (49mm)

| Valve Stroke | | Spring Return | | GAS | | GAS | | GAS | |
|-----------------|-------------------|---------------|--|----------|--------------------------|-------------------------|-------------------------|-----|--|
| | | Switch Coding | | Size | 2.5" & 3" .79" (20mm) | 4" & 5" 1.58" (40mm) | 6" & 8" 1.69" (43mm) | | |
| GAS Stroke Time | 51 s/in. (2s/mm) | | Default Setting for Simple Set Max 2-1/2 thru 8" | 40 Sec. | 80 Sec. | 86 Sec. | | | |
| | 102 s/in. (4s/mm) | | Optional Setting | 80 Sec. | 160 Sec. | 172 Sec. | | | |
| | 153 s/in. (6s/mm) | | Default Setting for 10" and 12" | 120 Sec. | 240 Sec. | 258 Sec. | | | |

DG Valve Stroke Times GAS Total Stroke = 1.93" (49mm)

| Valve Stroke | | Spring Return | | GAS | | GAS | |
|-----------------|-------------------|---------------|----------------------------------|----------|--------------------------|------------------------|--|
| | | Switch Coding | | Size | 2.5" & 3" .75" (19mm) | 4" & 6" 1.5" (38mm) | |
| GAS Stroke Time | 51 s/in. (2s/mm) | | Default Setting for Globe Valves | 38 Sec. | 76 Sec. | | |
| | 102 s/in. (4s/mm) | | Optional Setting | 76 Sec. | 152 Sec. | | |
| | 153 s/in. (6s/mm) | | Optional Setting | 114 Sec. | 228 Sec. | | |

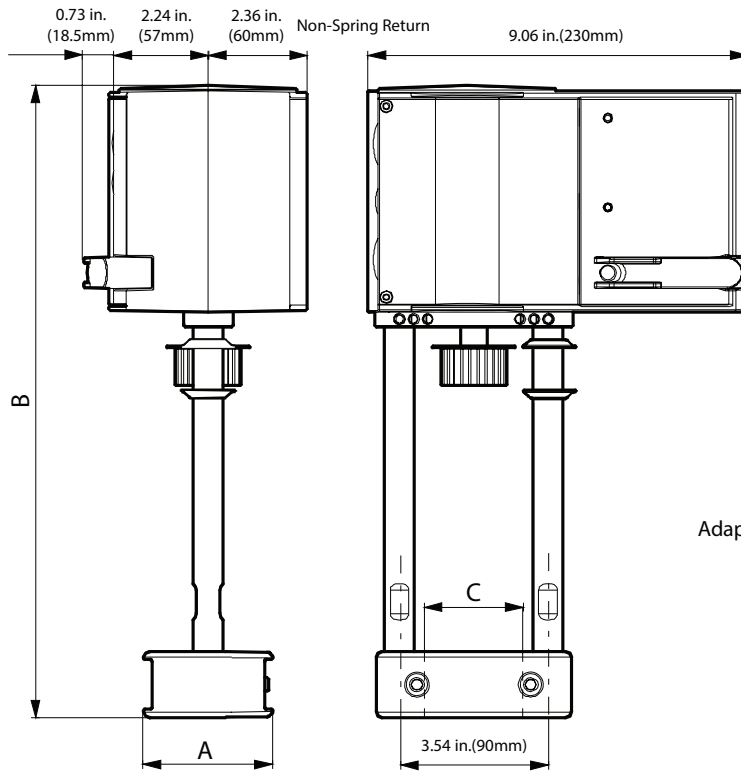
Stand Alone Actuator Stroke Times GAS Total Stroke = 1.93" (49mm)

| Valve Stroke | | Spring Return | |
|-----------------|-------------------|---------------|--|
| | | Switch Coding | |
| GAS Stroke Time | 153 s/in. (6s/mm) | | = Default Setting for Stand Alone GA Actuator |



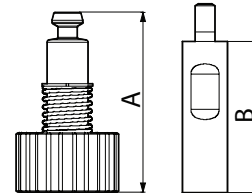
GAS Series - Actuators — Operating Instructions Continued

GAS - Dimensions



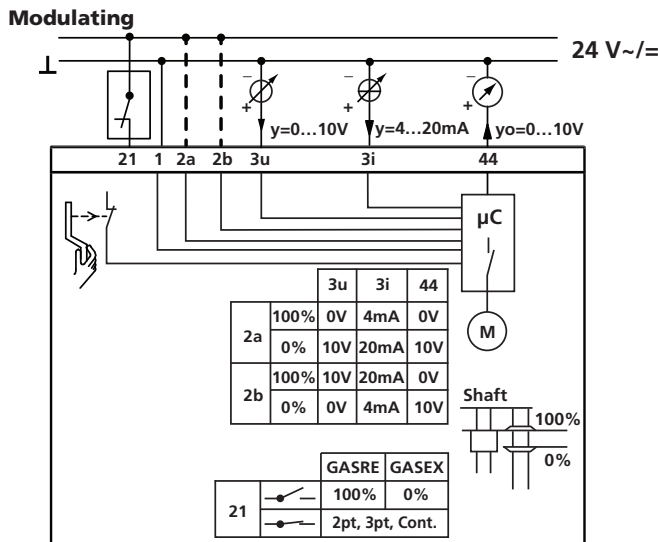
| Description | A | B | C |
|-------------|-----------------|-------------------|-----------------|
| GA Series | 2.52 in. (64mm) | 11.38 in. (289mm) | 1.73 in. (44mm) |

Adaptor for media temperatures between 266°F (130°C) and 464°F (240°C)

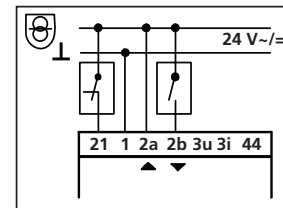


| Part Number | A | B |
|-------------|--------------------|------------------|
| 0372336 240 | 4.31 in. (109.4mm) | 3.94 in. (100mm) |

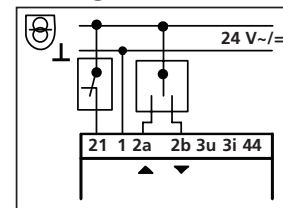
GAS - Wiring



On/Off (2 Point)



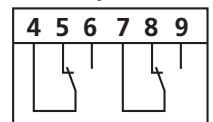
Floating (3 Point)



= Extra Low Voltage

Options

0372333 001
0372333 002
(Auxillary Switches)



- Y = modulating signal
- 1= Neutral/Common for power and signal
- 2a/2b- These terminals determine forward acting/reverse acting. Only one should be powered with 24V.
Reverse Acting 2a = Extends. 0 volts = 100% retracted. 10V = 0% retracted.
Forward Acting 2b = Retracts. 0 volts = 0% retracted. 10V = 100% retracted.
- 3u = 0 .. 10 V, in case of control by voltage
- 3i = 4 .. 20 mA, in case of control by current
- 44 = 0 .. 10 V Feedback, independent from the use of 3u or 3i