

# GS400

## Electronic *Auto-Ranging* DIN Panel Mounted Positioner

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### Features

- \* AC (115/230V) and DC (24V) versions available.
- \* Accepts either current or voltage command signal and either current, voltage, or three wire potentiometer feedback signal (type and range to be stated when ordering).
- \* Quick, four step, calibration sequence.
- \* An internally excited 4-20mA current output proportional to the actuator position.
- \* Manual mode which allows positioning by operation of front panel switches.
- \* Manual and Calibration mode entry protection.
- \* Housed in a DIN 43700, 72mmx72mm panel mount case - optional IP66 front cover.
- \* End of travel limit switch interlock and indication.

### Operation

The "GS400" is designed to be used for the closed loop positioning of reversing actuators. The instrument compares two analogue signals, one representing the desired position (command signal) and the other representing the actual position (feedback signal) of the actuator. A difference between these two signals will cause the outputs to operate, driving the actuator to the desired position. A positional dead band may be adjusted to overcome instability associated with mechanical overrun of the actuator.

### Wiring

The "GS400" rear terminals should be wired by a competent person to accepted electrical practices. Special attention should be given to the safe connection, routing, and fusing of the instrument supply and the actuator supply.  
AN EARTH CONNECTION MUST ALWAYS BE MADE TO TERMINAL 1.  
To ensure RFI compliance the analogue signals MUST be routed in copper braided screened cables with a fill factor density of at least 0.7. The screens should be terminated at the rear panel earthing block end only. Signal cables should be routed separately from power and switching conductors. The use of a bulk supply filter on the general system supply, including that to the actuator is recommended.

### Declaration of Conformity

EMC Directive 89/336/EMC

Relevant Standards EN50081-1 (Emissions)  
EN50082-1 (Immunity)



This product has been successfully tested to the relevant parts of the above standards. In order to retain this conformity the user must fully comply with the wiring instructions.

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### **First time operation**

#### **WARNING !!**

**The GS400 will always power-up into AUTO mode and therefore, the actuator and associated mechanical equipment connected to it could possibly move in an unpredictable manner during first time use and initial calibration. Ensure that all personnel take appropriate precautions.**

1. Ensure that end of travel limit switches and mechanical stops are correctly adjusted before operation.
2. Check the GS400 rear data label details for compatibility with the site supply, command, feedback, and re-transmitted position signals.
3. Make all connections. If the re-transmitted position signal is not required then terminals 16 and 17 will need to be connected together to complete the loop and display the position on the front panel.
4. If an external manual/calibration mode enable contact has been wired to terminals 11 and 18, then this contact should be closed (enabled).  
Alternatively, temporarily connect terminals 11 and 18 together.
5. Apply the instrument supply.  
The GS400 will always power-up into AUTO mode and actuator movement may be observed.  
In AUTO mode either or both the LOW and HIGH lights should be lit continuously.

Press and release the centre button to enter MANUAL mode

In MANUAL mode either or both the LOW and HIGH lights should be extinguished continuously.

6. In MANUAL mode operate the Increase  $\uparrow$  and Decrease  $\downarrow$  buttons. Check for the correct operation of the actuator. The appropriate light should show and as the actuator operates the front panel display should change in sympathy.

If at any stage the LOW or HIGH lights are flashing then this indicates that the relevant limit switch has been activated and the GS400 will prevent the actuator from operating in that direction.

A faint flickering of the HIGH and LOW lights during manual operation is normal.

**If there is no actuator movement or the actuator direction is reversed, then remove the supplies and check the wiring - particularly the actuator motor and the feedback potentiometer connections.**

### **Calibration**

***These procedures require access to the rear of the GS400 whilst power is connected, and should therefore only be undertaken by suitably trained personnel. Direct connections are made to the internal microprocessor so the user is advised to take anti-static precautions to minimise damage due to body charge.***

***To enter the calibration mode the external enable contact should be made or alternatively terminals 11 and 18 should be connected together.***

***The following steps form a complete sequence. If the sequence is interrupted (e.g. power supply failure) then the calibration will have to be re-started.***

1. Connect a command signal source to terminals 11 (-ve) and 12 (+ve).  
Connect a DVM (set to 200mA range) to terminals 16 (+ve) and 17 (-ve) to monitor the re-transmitted position signal.
2. Apply the instrument power. CAUTION - The GS400 will always power-up in AUTO mode
3. Press and hold the centre button (for approx. 5 seconds) until both the LOW and HIGH lights extinguish.  
Release the button. AUTO mode will be suspended during calibration.

**STEP A - Positional Calibration (Minimum)**

- i Check that the LOW light is pulsing (flashing if the limit switch is activated).
- ii Set the command signal source to the desired minimum value (e.g. 4mA).
- iii Operate the Increase ↑ and Decrease ↓ buttons to drive the actuator to the desired minimum position.
- iv Press and release the centre button to store the settings into memory and to advance to step b.

**STEP B - Positional Calibration (Maximum)**

- i Check that the LOW light is lit continuously (flashing if the limit switch is activated).
- ii Set the command signal source to the desired maximum value (e.g. 20mA).
- iii Operate the Increase ↑ and Decrease ↓ buttons to drive the actuator to the desired maximum position.
- iv Press and release the centre button to store the settings into memory and to advance to step c.

**STEP C - Re-transmitted Position Signal Calibration (Minimum)**

- i Check that the HIGH light is pulsing (flashing if the limit switch is activated).
- ii Adjust the command signal source until the desired reading is obtained on the DVM (e.g. 4mA), for the actuator minimum position.  
Note : The actual output of the command signal source should be ignored as it will be different to the reading on the DVM.
- iii Press and release the centre button to store the settings into memory and to advance to step d.

**STEP D - Re-transmitted Position Signal Calibration (Maximum)**

- i Check that the HIGH light is lit continuously (flashing if the limit switch is activated).
- ii Adjust the command signal source until the desired reading is obtained on the DVM (e.g. 20mA), for the actuator maximum position.  
Note : The actual output of the command signal source should be ignored as it will be different to the reading on the DVM.
- iii Press and release the centre button to store the settings into memory and to exit the calibration sequence.

**CAUTION - After exiting the calibration sequence the GS400 will return to the AUTO mode.**

4. Adjust the command signal source over the desired range and check that the actuator positions accordingly. Check that the correct re-transmitted position signal is also obtained.
5. The actuator may “hunt” about the desired position and not settle.  
The dead-band trimmer potentiometer (located on the right hand side of the GS400) should be adjusted (clockwise to increase) to overcome this “hunting”, but not too much so as to impair the positional accuracy.

The dead-band is factory set at approximately 0.5% of the command signal span. This setting should give stable positioning for medium speed (20-40 second transit) actuators. Faster actuators, or those with significant mechanical backlash in the feedback sensor, may require a wider dead band. Slow, precision actuators may well perform better with an even narrower dead band. Note however, that the dead band can be set to “zero” when any stable positioning will be impossible.

6. The front panel display is factory set to read 0 - 100 over a re-transmitted signal range of 4-20mA.  
If any other display range is required or another re-transmitted signal range is used, then the display will require re-calibrating.  
Two trimmer potentiometers are located on the left hand side of the instrument. The forward adjustment sets the display zero and the rear adjustment sets the display span. The adjustments are optimised for the 0-100 range, but it is possible to display as low as 0-20 although there will be an increase in “coarseness” of the adjustment. The zero and span adjustments have a significant interaction, so re-calibration can be a tedious process.

**Maintenance**

The GS400 is not user serviceable. It is recommended that the instrument and the actuator supplies are suitably protected by fuses or circuit breakers rated for the instrument and the full load current of the actuator. If a fault occurs then please return the unit to Orange Instruments, describing the nature and circumstances of the problem.

**Connections**

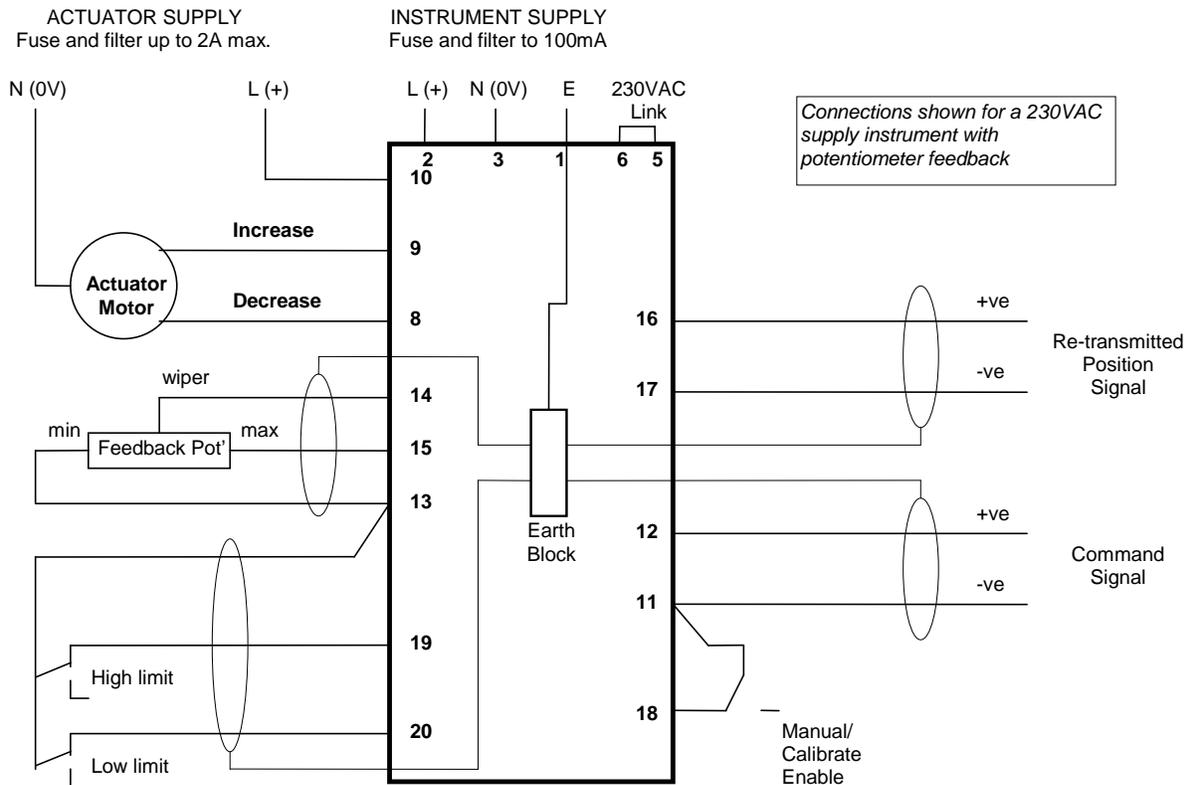
**LOWER TERMINAL BLOCK**

- 1 Supply : EARTH
- 2 Supply : LIVE (AC) or +(DC)
- 3 Supply : NEUTRAL (AC) or 0V (DC)
- 4 Supply select : For 115VAC supply link terminal 4 to terminal 5.
- 5 Supply select : For 230VAC supply - link terminal 5 to terminal 6.
- 6 Supply select : For 230VAC supply - link terminal 5 to terminal 6.
- 7 Supply select : For 115VAC supply - link terminal 6 to terminal 7.
- 8 Output : Decrease output switched Live (AC) or + (24VDC).
- 9 Output : Increase output switched Live (AC) or + (24VDC)
- 10 Common : Actuator supply Live (230VAC max.) or + (24VDC)

**UPPER TERMINAL BLOCK**

- 11 Command signal : Current/Voltage -ve
- Manual/Cal. Enable : Connect to terminal 18 to enable entry to Manual and Calibration modes.
- 12 Command signal : Current/Voltage +ve
- 13 Feedback Signal : Pot' Minimum or Current/Voltage -ve
- Limit switch : Common return
- 14 Feedback Signal : Pot' Wiper or Current/Voltage +ve
- 15 Feedback Signal : Pot' Maximum (No connection if Current/Voltage)
- 16 Position Output : Current +ve
- 17 Position Output : Current -ve
- 18 Manual/Cal. Enable : Connect to terminal 11 to enable entry to Manual and Calibration modes.
- 19 High limit switch : Switch made during normal operation, opens at limit.
- 20 Low limit switch : Switch made during normal operation, opens at limit.

**NOTE - The LOWER terminal block carries the high voltage instrument supply and load switching connections. DO NOT swap the upper and lower connectors - double-check when re-connecting the plug-in terminals.**



**Front Panel Indicator Descriptions**

## Auto/Manual Modes

HIGH	LOW	Description
On	On	Auto mode. Neither limit switch activated
On	Flashing	Auto mode. Low limit switch activated
Flashing	On	Auto mode. High limit switch activated
Off	Off	Manual mode. Neither limit switch activated
Off	Flashing	Manual mode. Low limit switch activated
Flashing	Off	Manual mode. High limit switch activated

## Calibration Mode

HIGH	LOW	Description
Off	Pulsing	Step 1. Position zero
Off	On	Step 2. Position span
Pulsing	Off	Step 3. Re-transmitted position signal zero
On	Off	Step 4. Re-transmitted position signal span

*Note : If a limit switch is activated then the relevant light will flash and not pulse or be on*

**Fault Finding Guide**

SYMPTOM	ACTION
The display and lights do not function The buttons have no effect	Check the instrument supply fuse Check all connections are correct and secure
The display shows -25.0	Check that the feedback connections are correct and secure
The display reading travels in the opposite direction to that expected	Check that the feedback connections are correct
Both the LOW and HIGH lights flash	Check that the limit switches are correctly adjusted and correctly connected
The actuator does not operate in either Auto or Manual modes	Check the actuator supply fuse Check that all connections are correct and secure
The actuator does not operate in Auto but does operate in Manual.	Calibrate the instrument
The INC and DEC lights are always operating and the actuator does not settle at the desired position	Increase the Dead-band

**Specification**

**Instrument Supply**

AC : 115V or 230V (+/- 10%) 50/60Hz. Instrument only loading 3VA maximum  
 DC : 24V (18-36V) Instrument only loading 4VA maximum

**Command Signal Input**

Voltage : In the range 0 to 10V DC (Input Impedance 66K)  
 Current : In the range 4 to 20mA DC (Input Impedance 200R)

**Feedback Signal Input**

Potentiometer : In the range 1K0 to 100K, 3 wire type  
 Voltage : In the range 0 to 10V DC (Input Impedance 66K)  
 Current : In the range 4 to 20mA DC (Input Impedance 200R)

**Re-transmitted Position Signal Output (Internally Excited)**

Current : In the range 0 to 20mA DC (Maximum Load 750R)

**Switched Outputs**

AC outputs - Solid State Relays with an external common supply feed  
 Rated at 2A, 70V to 250V AC @ 50/60Hz isolated from the instrument to 4000V rms.  
 CR Suppression network incorporated  
 DC outputs - High side FET switches 2A maximum each, with an external common supply feed.

**Adjustments**

Auto / Manual selection button. Manual Increase ↑ / Decrease ↓ buttons  
 Positional Dead-Band adjustment Display zero and span adjustments

**Environmental**

Rating (with module secured in panel) - IP51 (IP66 with optional cover)  
 Operating Temperature : 0 to 50 deg. C.  
 Microprocessor operating frequency - approx 30KHz (RC oscillator)

**Theoretical accuracy**

Analogue to digital / digital to analogue conversion - 12bits (range of 1 in 4096)  
 Comparator resolution - +/- 1bit  
 Typical positional accuracy (mainly mechanical backlash and inertia) - +/-1%

