AP51 In-actuator Electronic Positioner- dc

Introduction

The **AP51** is designed to position a quarter turn electric actuator in sympathy with an incoming analogue command signal.

SAFETY !!

ELECTRIC SHOCK HAZARD
Always ensure control of the supply to the positioner and actuator.
Dangerous voltages can be present with 230/115V supply equipment.

INJURY HAZARD
The actuator and associated mechanical equipment could operate in an unpredictable manner during initial operation and calibration. Appropriate precautions must be taken.

Declaration of Conformity

CE

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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Operation Overview

The **AP51** is designed 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 **AP51** outputs to operate, driving the actuator to the desired position. With link 2 in, the actuator position will "freeze" on loss of command signal (4-20mA only). A positional Dead-Zone may be adjusted to overcome "hunting" problems associated with any mechanical overrun of the actuator.

Physical

The **AP51** is normally mounted on a carrier plate and is fitted by the actuator supplier.

Wiring

The **AP51** is supplied with 0.1" connectors for circuits within the actuator and screw terminals for external connections. Refer to the connector / terminal lists on Page 3.

To ensure conformance to the standards detailed above, please follow the guidelines below

An instrument earth connection is available within the actuator enclosure.

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 to the metal of the actuator housing, ideally at a suitable metal cable gland.

Signal cables should be routed separately from power and switching conductors.

The use of a bulk supply filter on the general system supply is recommended.

Refer to the connections on Page 3 and the attached wiring diagram for layouts and terminal numbers.
Always check wiring against the application-wiring diagram supplied with the actuator assembly.

Terminal capacity is 0.5 mm^2. Do not strain the printed circuit board terminals when connecting the field wiring.

Connections - these are included for completeness, the Manufacturer will normally undertake positioner to actuator wiring. Please consult the actuator handbook for customer wiring details.

There are three groups of connections on the AP51.

Group 1 – supply and signal terminals

1	Re-transmitted position signal, positive	Red	0.25mm^2	24Vdc
2	Re-transmitted position signal, negative	Purple	0.25mm^2	24Vdc
3	Command signal, positive	Yellow	0.25mm^2	24Vdc
4	Command signal, negative	Black	0.25mm^2	24Vdc
5	Supply positive	Red	0.5mm^2	24Vdc
6	Supply neutral	Black	0.5mm^2	24Vdc

Group 2 – actuator motor and limit switches

Connections are via a 0.1" pitch connector, wired by the manufacturer. DO NOT disconnect this group when power is supplied to the actuator. The connections are given for information only.

D	Actuator decrease connection	Orange	16/0.2mm	24Vdc
I	Actuator increase connection	Pink	16/0.2mm	24Vdc
Hi	High limit – only for volt free limit switches	Purple	7/0.2mm	5Vdc
Lo	Low limit – only for volt free limit switches	Yellow	7/0.2mm	5Vdc
COM	Common – only for volt free limit switches	Brown	7/0.2mm	5Vdc

For actuators with live limit switches, i.e. those, which break the actuator motor, supply, Hi and Lo are linked to COM at the connector.

Group 3 – feed back potentiometer connections

Connections are via a 0.1" pitch connector, wired by the manufacturer. DO NOT disconnect this group when power is supplied to the actuator. The connections are given for information only.

Mx	Feedback potentiometer Maximum	White	0.25mm^2	5Vdc
Wp	Feedback potentiometer Wiper	Grey	0.25mm^2	5Vdc
Mn	Feedback potentiometer Minimum	Green	0.25mm^2	5Vdc

First time operation and calibration

WARNING !!
The actuator and associated mechanical equipment connected to it could possibly move in an unpredictable manner during initial calibration. Ensure that all personnel take appropriate precautions. The calibration procedure involves the operation of printed circuit mounted switches. To avoid static body charge damage to the circuit board components, it is advisable to wear a purpose-built wrist-strap, grounded to earth via a 1M-ohm resistor.

Note that the AP51 is normally factory calibrated for its accompanying actuator and valve and should not require recalibration or any adjustments to linking.

1. Ensure that end of travel limit switches and mechanical stops are correctly adjusted before operation.
2. Check the Manufacturer's delivery documents for supply and command signal details and compare this with site information.
3. Check that the command signal has been correctly specified. The calibration procedure described below assumes a "standard" 4-20mA-command signal. For other types or ranges of command signal, 4mA represents "minimum", 20mA "maximum" and 12mA 50% of the command signal used
4. Wire the actuator to a suitable supply. Connect a suitable command signal source, set at 12mA. Connect a DVM on a 0-200mA range, to measure the re-transmitted signal.
5. Switch on power. The actuator may travel to a limit or settle at an intermediate position. It is possible that the actuator might "hunt" about a position.
6. Press and hold the Calibration Switch SW1. The nearby red LED will light. The LED will extinguish within a few seconds. Release SW1 and the LED will light continuously.
7. Use the actuator manual facilities to set the actuator at mid point of its normal travel. If a mechanical adjustment is not available, it is possible to move the actuator by adjusting the command signal to 11mA or less to drive down or 13mA or more to drive up.
8. Carefully loosen the actuator feedback potentiometer (check manufacturer's information for identification) and adjust until the LED flashes quickly. The potentiometer is now set centrally with respect to the mechanical travel of the actuator. Tighten the feedback potentiometer. Set the command signal to 4mA and check that the actuator travels to its minimum desired position and stops on the lower limit switch.
9. Press and hold the Calibration Switch until the LED extinguishes. Release the switch and the LED will flash once briefly every couple of seconds.
10. Adjust the on-board potentiometer RV1 such that the re-transmitted position signal, monitored on the DVM, reads 4mA.
11. Press the Calibration Switch and hold until the LED extinguishes. Release the switch and check that the LED lights continuously. Set the command signal to 20mA and check that the actuator travels to its maximum desired position and stops on the upper limit switch.
12. Press and hold the Calibration Switch until the LED extinguishes. Release the switch and the LED will flash twice briefly every couple of seconds.
13. Adjust the on-board potentiometer RV1 such that the re-transmitted position signal, monitored on the DVM, reads 20mA.
14. Press the Calibration Switch and hold until the LED extinguishes. The calibration procedure is now complete.
15. Set the command signal to 12mA. The actuator will move from the maximum position to around 75% of travel. Carefully turn the on-board potentiometer RV1anticlockwise and check that the actuator gradually moves towards its mid point of travel. It will probably be necessary to wind RV1 back clockwise slightly to counter any instability in positioning. This Dead Zone adjustment can be made at any time during normal operation.

Manual Operation

Outside the Calibration routine, there is no Manual facility on the **AP51**.

Linking Options

Link 1 is not used on the dc version.
Freeze option (4-20mA only) when link 2 is in. Otherwise drive down on command signal break.

Specification

COMMAND SIGNAL INPUT
This signal is NOT galvanically isolated from the power supplies ground and MUST NOT share a common ground in the users peripheral equipment.
The following options are available, factory selected on order.
Current anywhere in the range 0 – 50mA. Voltage anywhere in the range 0 – 50Vdc.
Typical ranges are:
4-20mA nominal 200R input impedance
0-10V nominal 360K input impedance

ANALOGUE POSITION OUTPUT SIGNAL
This signal is NOT galvanically isolated from the command signal and MUST NOT share a common ground in the users peripheral equipment.
4-20mA self powered, can drive up to 300R

FEEDBACK SIGNAL INPUT
This signal is NOT galvanically isolated from the command signal and MUST NOT share a common ground in the users peripheral equipment.
Potentiometer: 3-wire, any value greater than 1K. Continuous film track preferred.

SWITCHED OUTPUTS
This signal is NOT galvanically isolated from the command signal and MUST NOT share a common ground in the users peripheral equipment.
Outputs are derived from a solid state switch.

INSTRUMENT SUPPLY
24VDC +/-2V, 3VA – (controller only).

USER ADJUSTMENTS - the following functions are available
Calibration pushbutton switch – SW1
Calibration indicator LED
Calibration / Dead Zone adjustment potentiometer RV1

PERFORMANCE - the following applies to the AP51 only, characteristics of the feedback element and actuator system response will have additional effects.

Conversion	10 bit max., normal conversion range (4-20mA) = 1 in 800.
O/P switch res.	+/-1 bit theoretically, modified to up to +/-25% of span by dead band .
Accuracy (Theo.)	0.125% span based on conversion resolution of 1 in 3200.
Accuracy (actual)	0.5% span based on 25% turn down of feedback range.