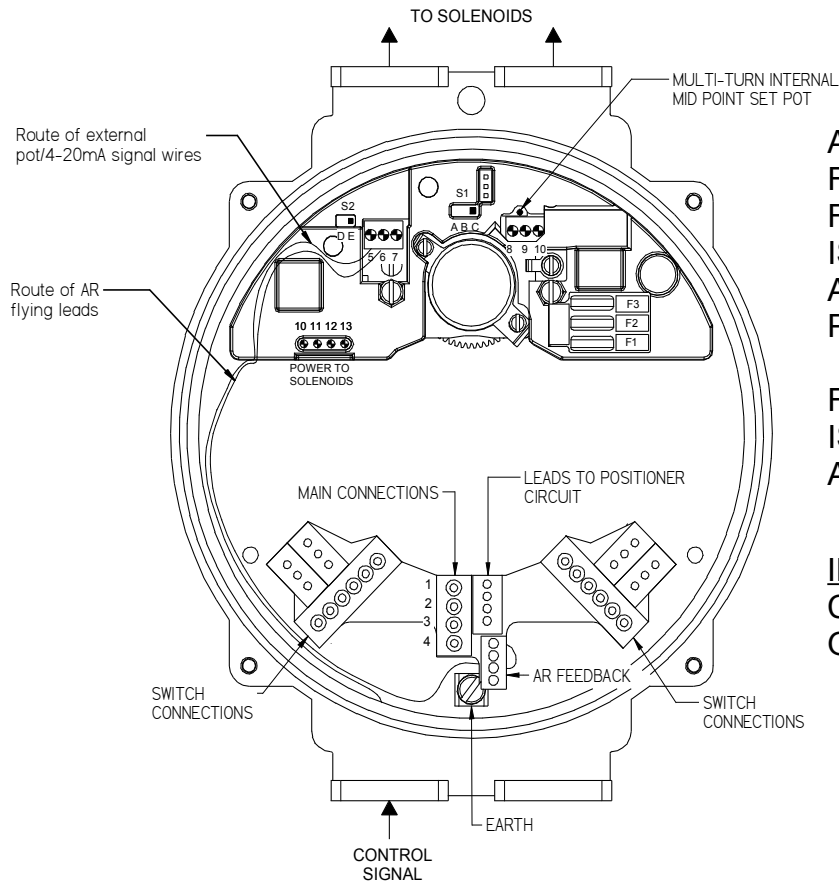




# P3 3-STOP POSITIONER IOM



Air connections  
 Fail-free, Spring Return,  
 Fail Down  
 ISO/DIN – G1/8  
 ANSI – 1/8 NPT  
 Ports identified on block

Fail-Hold  
 ISO/DIN - G1/4  
 ANSI - 1/4 NPT

**IMPORTANT**  
**CASE MUST BE**  
**GROUNDED**

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# P3 3-STOP POSITIONER IOM

## General information

### Operating modes & direction

The P3 has four fail operation modes detailed below

Operating Mode	Loss of power	Loss of Air	Loss of power and air
Double Acting Fail Free	Free to move	Free to move	Free to move
Double Acting Fail Down	Return to downscale	Free to move	Free to move
Double Acting Fail hold	Hold in last position	Free to move	Hold in last position
Spring return	Return to downscale	Return to downscale	Return to downscale

Upscale and downscale can be at either end of the stroke.

### Control methods

To select the up-scale, mid-point and down scale position a live (voltage must match unit specification) is connected to one of the three main connections; if the unit is to be used solely with an external control signal the up-scale and down scale connections are not required.

### Mid-point setting options

There are three methods to set the mid point:

Internal potentiometer (factory default) - On-board potentiometer is adjusted to set mid-point position between 0° and 90°.

External potentiometer – Mid-point position can be changed by varying an external potentiometer to give a point between 0° and 90°.

External 4-20mA signal – Mid-point position can be changed by varying an external 4-20mA signal to give a point between 0° and 90°.

### Switches

Switches / sensors can be fitted inside the control box. These are independent from the P3 circuit and connected via the multi-terminal block.

NOTE: Units are factory set to operating modes and direction as ordered. Zero and Gain potentiometers should not require adjustment for accurate use. Adjustment of Deadband and damping potentiometers may be required depending on load characteristics.



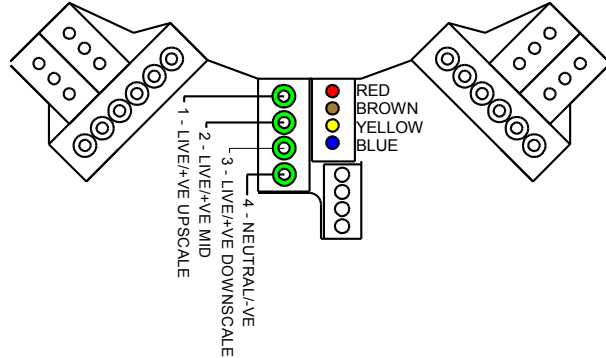
# P3 3-STOP POSITIONER IOM

## Standard installation

Installing a unit as supplied for each operating mode is shown below.

### Fail free and Fail hold

- Connect up-scale live wire to 1
- Connect mid-point live wire to 2
- Connect down-scale live wire to 3
- Connect neutral wire to 4
- Connect Earth

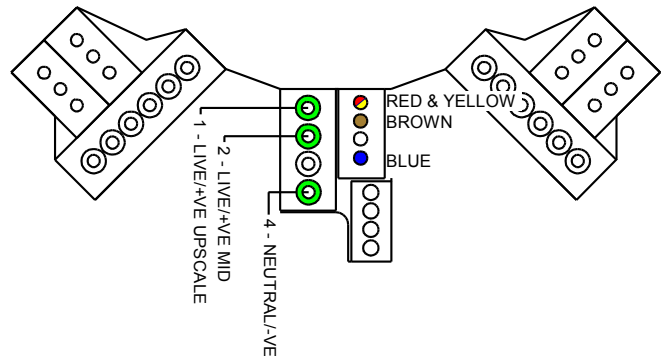


Go to mid-point set section (page 4)

Note: If the unit is to be used solely with an external control signal the up-scale (1) and down scale (3) connections are not required.

### Fail down and Spring return

- Connect up-scale live wire to 1
- Connect mid-point live wire to 2
- Connect neutral wire to 4
- Connect Earth



Go to mid-point set section (page 4)

Notes: There is no down-scale connection; when both up-scale and mid-point are de-energised the unit will travel down-scale.

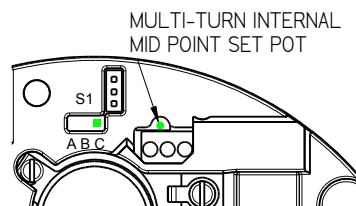
If the unit is to be used solely with an external control signal the up-scale (1) connection is not required.



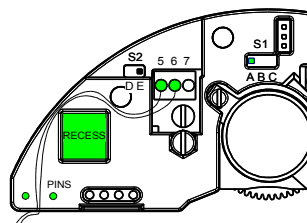
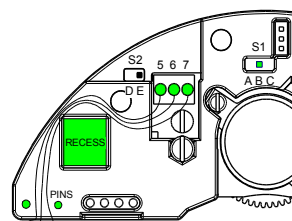
# P3 3-STOP POSITIONER IOM

## Mid-point set

- Internal – Set S1 to C (factory default)  
Adjust position with mid point set pot.
- External potentiometer – Set S1 to B  
Connect external potentiometer  
5 (-), 6 (wiper), 7 (+) minimum value 5KΩ.  
Route wires around recess if fitting AR circuit  
and through pins.



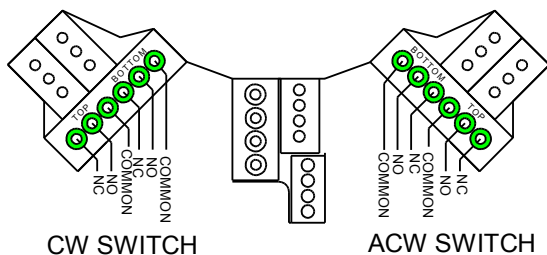
- External 4-20mA source – Set S1 to A  
Connect 4-20mA source 5 (-) & 6 (+).  
Route wires around recess if fitting AR circuit  
and through pins.



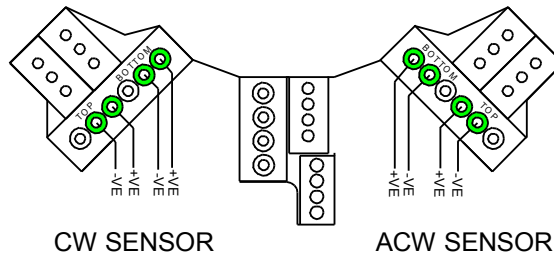
Input impedance - 250 Ohm. Signal should float relative to supply and solenoid output potentials.

## Switch connection

Connect switch wires if fitted



Connect sensor wires if fitted

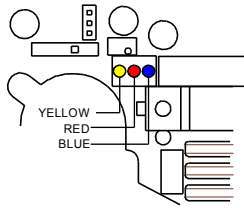




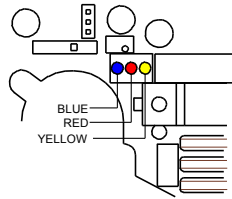
# P3 3-STOP POSITIONER IOM

## Changing operating direction

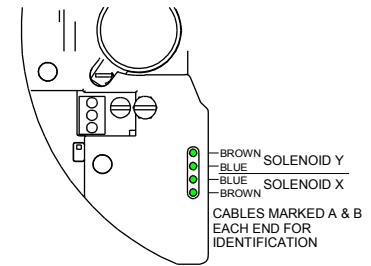
### Anti-clockwise on rising signal



### Clockwise on rising signal

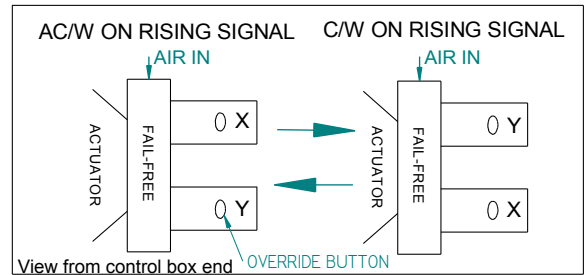


### Solenoid connections



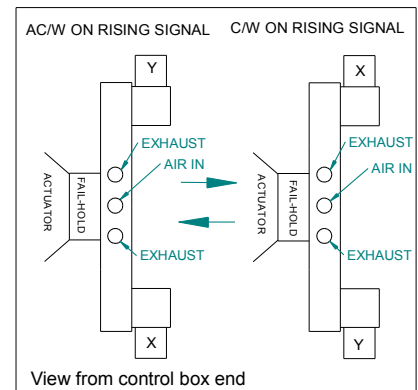
## Fail free double acting

- 1) Potentiometer wires set as shown above
- 2) Swap solenoid cables (or rotate whole solenoid block by 180° if desired)
- 3) Follow set-up process (page 10)



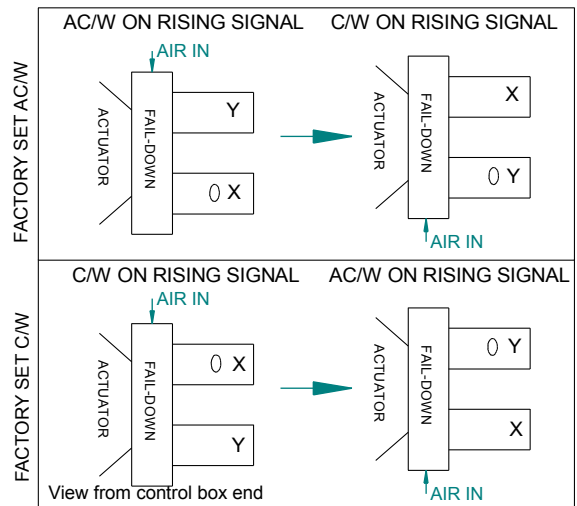
## Fail-hold double acting

- 1) Potentiometer wires set as shown above
- 2) Swap solenoid cables (or rotate whole solenoid block by 180° if desired)
- 3) Follow set-up process (page 10)



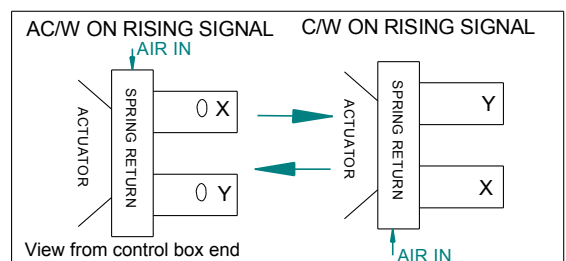
## Fail down double acting

- 1) Potentiometer wires set as shown above
- 2) Rotate solenoid block by 180°
- 3) Follow set-up process (page 10)



## Spring return

- 1) Potentiometer wires set as shown above
- 2) Rotate solenoid block by 180°
- 3) Follow set-up process (page 10)





# P3 3-STOP POSITIONER IOM

## Changing operating modes

### Change to Fail free double acting

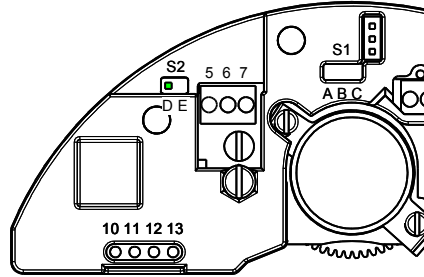
Changing from	Parts required
Fail Down double acting	NONE
Spring return	SP1702
Fail hold double acting	SP1702 + SP1705 (110AC/24DC) OR SP1706 (240AC/48DC)

Do not move circuit potentiometers

Position solenoid valves with override buttons facing the same direction.

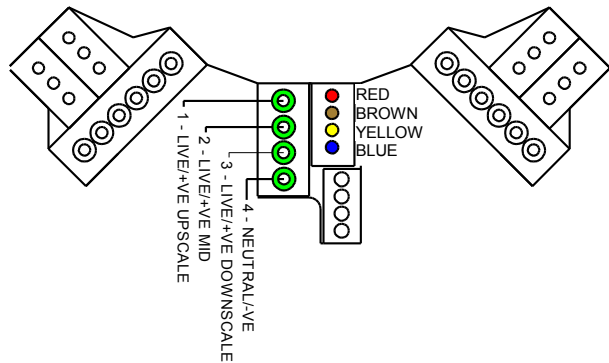
Connect solenoids for given connection (see Changing operating direction section – page 5)

Set switch S2 to D position



Connect internal wiring:

- 1 – RED
- 2 – BROWN
- 3 – YELLOW
- 4 – BLUE



Follow standard installation process (page 3)



# P3 3-STOP POSITIONER IOM

## Change to Fail Down double acting

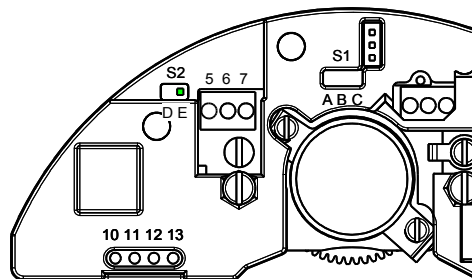
Changing from	Parts required
Fail Free double acting	NONE
Spring return	SP1702
Fail hold double acting	SP1702 + SP1705 (110VAC/24VDC) OR SP1706 (240VAC/48VDC)

Do not move circuit potentiometers

Position solenoid valves with override buttons facing opposite directions.

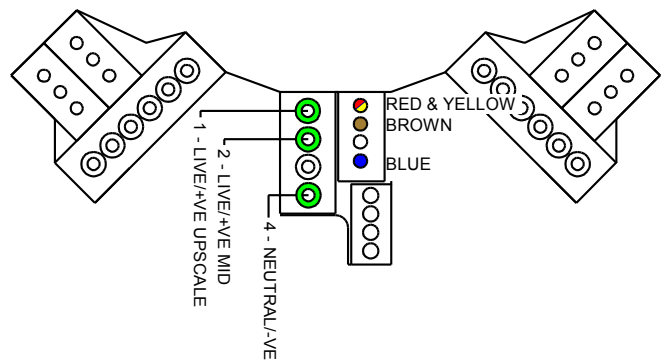
Connect solenoids for given connection (see Changing operating direction section – page 5)

Set switch S2 to E position



Connect internal wiring:

- 1 – RED & YELLOW
- 2 – BROWN
- 3 – NONE
- 4 – BLUE



Follow standard installation process (page 3)



# P3 3-STOP POSITIONER IOM

## Change to fail hold double acting

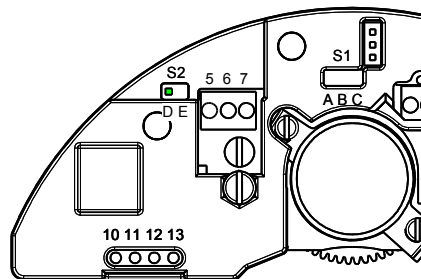
Changing from	Parts required
Fail Free double acting	SP638 + SP1718 (24VDC) OR SP1719 (48VDC) OR SP1720 (110VAC) OR SP1721(240VAC)
Fail Down double acting	SP638 + SP1718 (24VDC) OR SP1719 (48VDC) OR SP1720 (110VAC) OR SP1721 (240VAC)
Spring return	SP638 + SP1718 (24VDC) OR SP1719 (48VDC) OR SP1720 (110VAC) OR SP1721 (240VAC)

Do not move circuit potentiometers

Attach SP638 and new solenoid to actuator

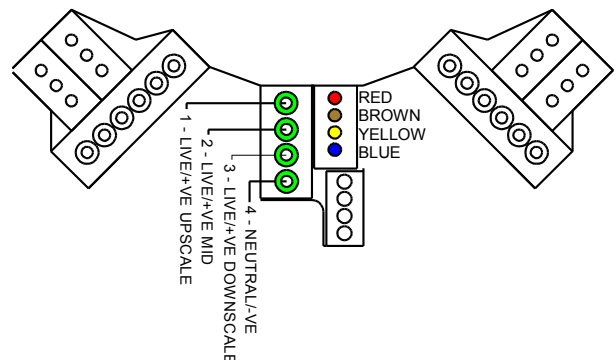
Connect solenoid for given connection (see Changing operating direction section – page 5)

Set switch S2 to D position



Connect internal wiring:

- 1 – RED
- 2 – BROWN
- 3 – YELLOW
- 4 – BLUE



Follow standard installation process (page 3)





# P3 3-STOP POSITIONER IOM

## Change to spring return

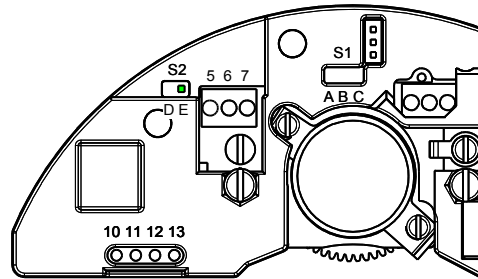
Changing from	Parts required
Fail Free double acting	SP1704
Fail Down double acting	SP1704
Fail hold double acting	SP1704 + SP1705 (110VAC/24VDC) OR SP1706 (240VAC/48VDC)

Do not move circuit potentiometers

Assemble solenoid valves as shown, install new solenoid block assembly with 4 'o'rings (2 on screws).

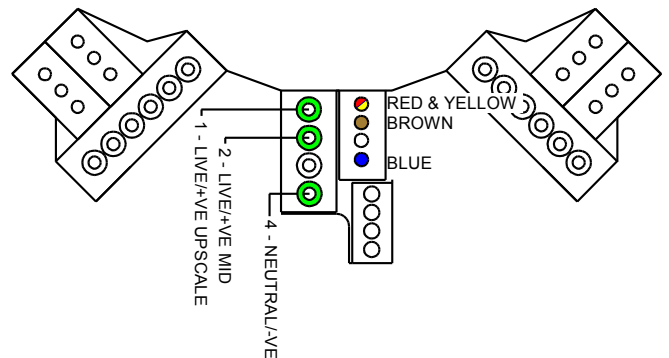
Connect solenoids for given connection (see Changing operating direction section – page 5)

Set switch S2 to E position



Connect internal wiring:

- 1 – RED & YELLOW
- 2 – BROWN
- 3 – NONE
- 4 – BLUE



Follow standard installation process (page 3)



# P3 3-STOP POSITIONER IOM

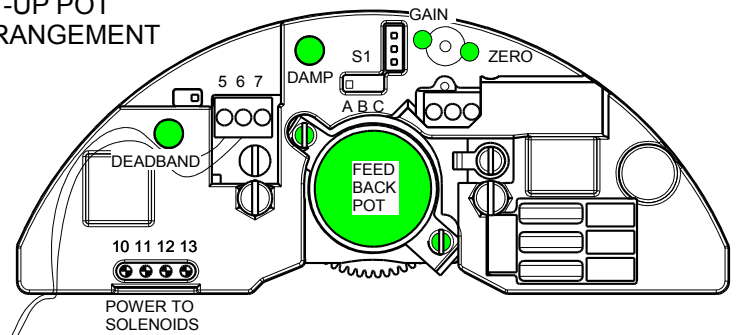
## Positioner set-up procedure

Potentiometers have limited travel, do not wind past their stop or apply excessive axial pressure, this will result in potentiometer damage.

### Deadband Optimisation

Move positioner to midpoint position (by switching input, or changing signal if used). Rotate deadband preset fully anti-clockwise using small screwdriver positioner should hunt about its position. Rotate deadband pot slowly clockwise until deadband is wide enough to stabilise position without hunting.

SET-UP POT ARRANGEMENT



### Damping Adjustment

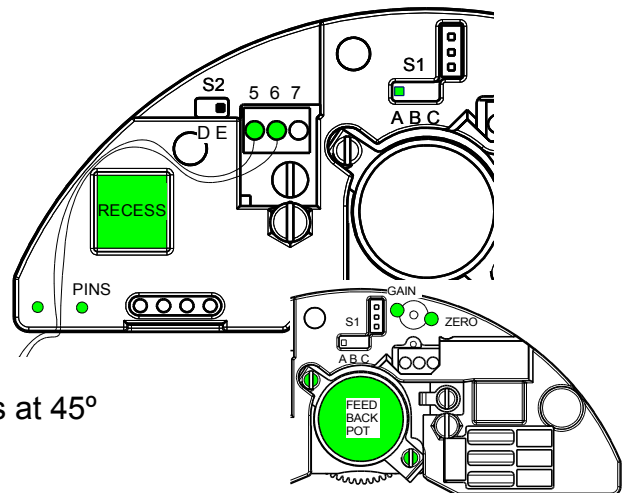
If high speeds or heavy loads are present, rotate damping preset clockwise using small screwdriver to increase speed-proportional setpoint advance. This should allow use of narrower deadband setting for better positioner precision. Too high damping setting gives multiple firing of solenoid valves as positioner approaches setpoint.

### Set-up using 4-20mA signal source

Connect 4-20mA signal source to 5 (-) & 6 (+)  
Set switch S1 to A

#### Set potentiometer centre

- Set ZERO and GAIN pots to mid point
- Set source to 12mA
- Turn on positioner to mid-point
- Rotate feedback potentiometer until actuator is at 45°
- Secure feedback potentiometer with 2 screws



#### Set ZERO and GAIN

There are two methods to set ZERO and GAIN to ensure the actuator end stops do not interfere with P3 set-up, follow one of the procedures below:

Wind out actuator end stop screws to increase travel by 2 degrees per side.	With the actuator stop screws set for 0° and 90° travel
Set source to 4mA Rotate ZERO pot until actuator at 0° Set source to 20mA Rotate GAIN pot until actuator at 90°	Set source to 5mA Rotate ZERO pot until actuator at 5.6° Set source to 19mA Rotate GAIN pot until actuator at 84.4°
Repeat above steps until 4mA = 0° and 20mA = 90°	Repeat above steps until 5mA = 5.6° and 19mA = 84.4°



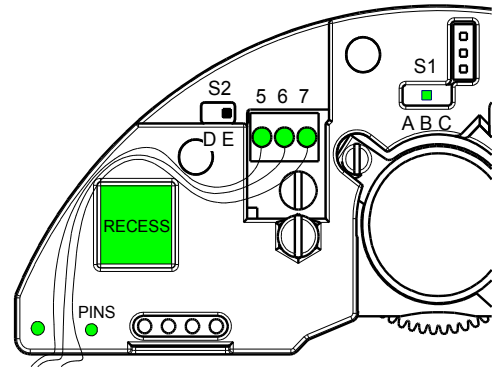
# P3 3-STOP POSITIONER IOM

## Set-up using potentiometer (minimum value 5K $\Omega$ )

Connect potentiometer 5 (-), 6 (wiper) & 7 (+)  
Set switch S1 to B

### Set potentiometer centre

Set ZERO and GAIN pots to mid point  
Set potentiometer to centre  
Turn on positioner to mid-point  
Rotate feedback potentiometer until actuator is at 45°  
Secure feedback potentiometer with 2 screws

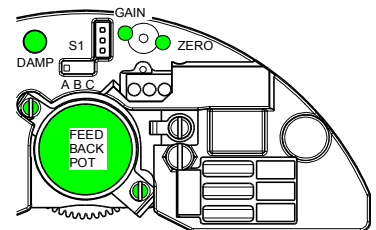


### Set ZERO and GAIN

During setting ensure the vane is not contacting the actuator end stop screws, wind out actuator end stop screws by 2 degrees.

Set potentiometer to low end  
Rotate ZERO pot until actuator at 0°  
Set potentiometer to high end  
Rotate GAIN pot until actuator at 90°

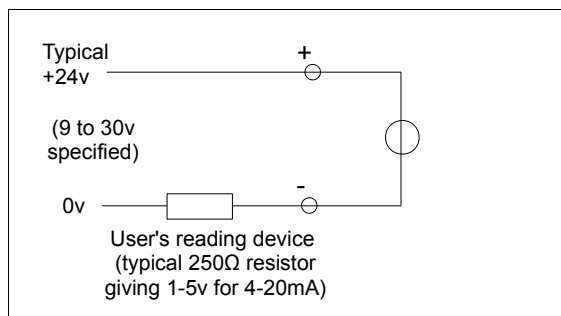
Repeat above steps until low end = 0° and high end = 90°



## Optional Angle Retransmit (AR) Circuit

Remove AR circuit before setting up main positioner. De-energise all connectors before fitting/refitting AR circuit. To mount AR circuit, carefully line up three-pin connector on AR circuit with socket on main positioner board, and lower onto red plastic cover moulding. See Figure 1 for route to be used for AR leads (and external pot/4-20mA input leads if used). Fit 3 mounting screws (2 x M3 x 5, 1 x M2 x 8) and tighten gently.

Typical user circuit



Note - the circuit passes a controlled current, linearly proportional to the position read by the main positioner feedback pot. This current is a function only of the position read and remains constant whatever the supply voltage (within the 9 to 30V range permitted). The AR circuit is electrically isolated from the positioner circuit, and will read the position even when the positioner is de-energised, as long as the AR loop power voltage is present.

To adjust the 4-20mA output correctly for the position range set on the main positioner, follow the following steps:

- Move to bottom range position.
- Adjust zero preset on AR circuit using small screwdriver engaging horizontally with the multi-turn screw, until 4mA reading is achieved.
- Move to top range position.
- Adjust range preset on AR circuit (as above) until the 20mA reading is correct.
- Repeat steps (a) to (d) until correct reading is seen at both ends.



# P3 3-STOP POSITIONER IOM

**DISCONNECT ELECTRICAL POWER, SIGNALS, AND AIR SUPPLY BEFORE ATTEMPTING ANY DISASSEMBLY.**

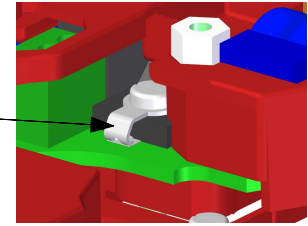
### 3 stop circuit

#### Removal

Disconnect 4 flying leads from multi-terminal circuit  
Disconnect 4 solenoid wires from positioner terminal  
Remove 2 screws (2 x M3)  
Lift vertically to disengage sprung feedback gear - take care not to lose special earthing washer on near end screw

#### Installation

Mesh feedback gear  
Install 2 screws (2 x M3 brass) - take care to locate special earthing washer correctly  
Connect solenoid wires to circuit  
Connect flying leads to multi-terminal circuit



Special earthing washer

### AR circuit

#### Removal

Remove 3 screws (2 x M3, 1 x M2)  
Lift vertically to disengage 3 pin connector

#### Installation

Engage 3 pin connector  
Lower AR circuit - if external pot or 4-20mA signal used ensure wires are not trapped by IC  
Install 3 screws

### Coupling

#### Removal

Loosen grub screw at coupling base (1.5mm A/F Allen key)  
Remove coupling retainer screw (M3 cross head)  
Lift coupling

#### Installation

Lower coupling onto square and mesh feedback gear  
Install coupling retainer and screw  
Tighten grub screw at base of coupling

Route for external pot/4-20mA signal cables and AR 4-20mA cables

### Multi-terminal

#### Removal/Installation

Remove / install 2 screws

### Control box

#### Removal

Remove coupling  
Remove 2 M8 screws  
Retain gasket under box

#### Installation

Place gasket on actuator  
Install 2 M8 screws (use loctite 222 or equivalent)  
Replace coupling

### Solenoid

#### Removal

Disconnect air  
Disconnect DIN plugs  
Remove 2 screws  
Retain 3 o-rings

#### Installation

Place 3 o-rings  
Install 2 screws  
Connect DIN plugs

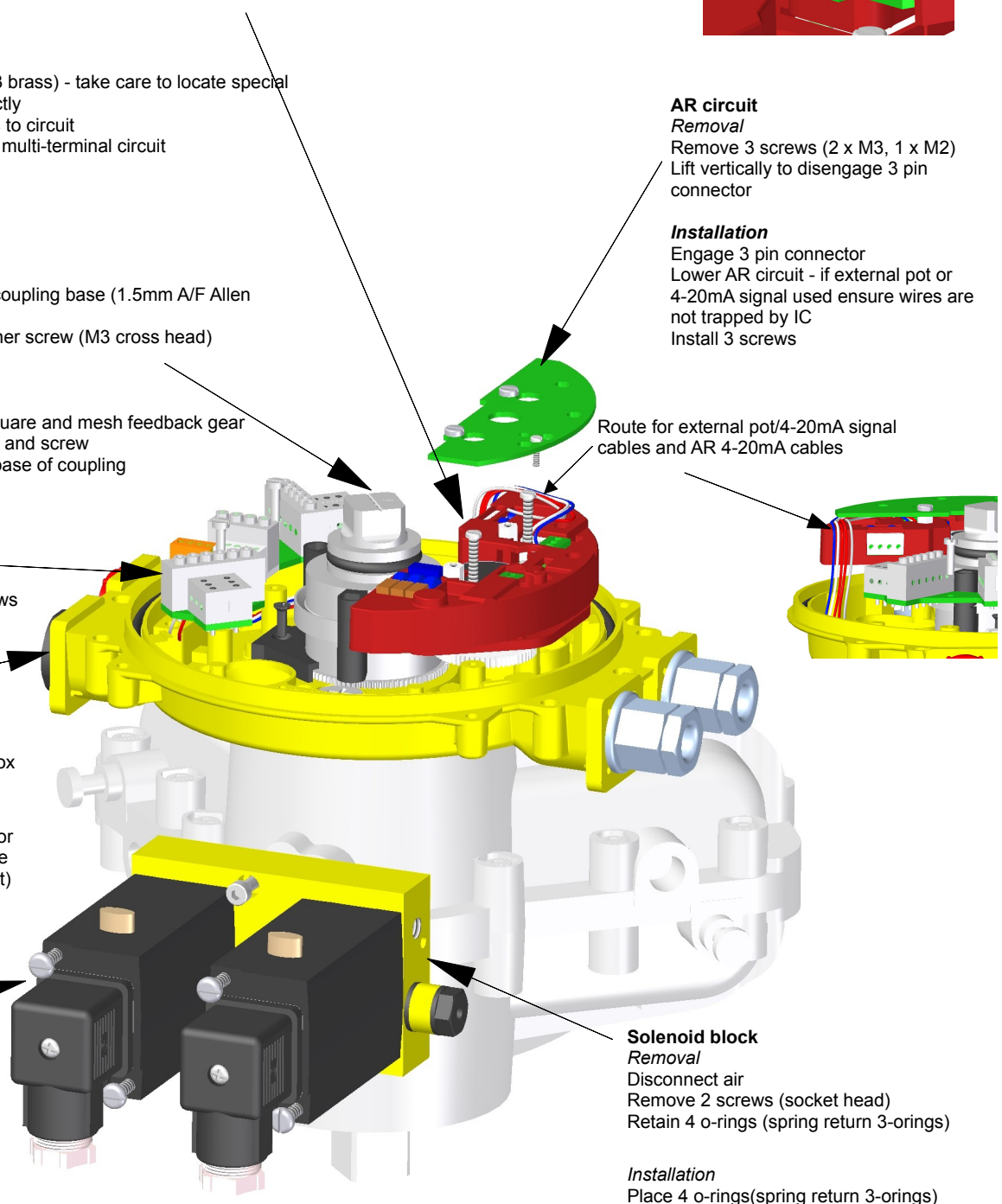
### Solenoid block

#### Removal

Disconnect air  
Remove 2 screws (socket head)  
Retain 4 o-rings (spring return 3-orings)

#### Installation

Place 4 o-rings (spring return 3-orings)  
Install 2 screws





## P3 3-STOP POSITIONER IOM

### Trouble shooting

Problem	Solution
Actuator goes between limits no response on mid-point	Check solenoid and feedback pot direction (page 5) Check fuse F2
Actuator will not go to one limit	Check fuses F1 and F3
Actuator has poor control	Positioner set-up required (page 10)
Poor solenoid response	Ensure solenoids are free from dirt

### Spares Codes

SP1701 - P3 main circuit  
SP1702 – Fail-free / Fail down adaptor block  
SP638 – Fail-hold adaptor block (Namur adaptor)  
SP1704 – Spring return adaptor block  
SP1705 – Solenoid 24Vdc/110Vac pair (not fail hold)  
SP1706 – Solenoid 48Vdc/240Vac pair (not fail hold)  
SP1718 – Solenoid Fail-hold 24Vdc  
SP1719 – Solenoid Fail-hold 48Vdc  
SP1720 – Solenoid Fail-hold 110Vac  
SP1721 – Solenoid Fail-hold 240Vac  
SP1711 – Angle Retransmit circuit  
SP1712 - Solenoid 24Vdc/110Vac single (not fail hold)  
SP1713 - Solenoid 48Vdc/240Vac single (not fail hold)

See sales literature (KF633) for order codes and dimensions of box.