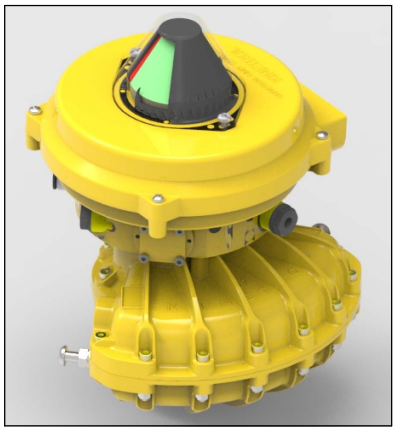
DP3 Positioner

The DP3 is a positioner that is capable of modulating with an external demand signal control, but which can also function as an ON/OFF device if required to simply drive a valve fully open /closed. It can also be configured to move to a user defined intermediate position without the need for any external demand signal control.



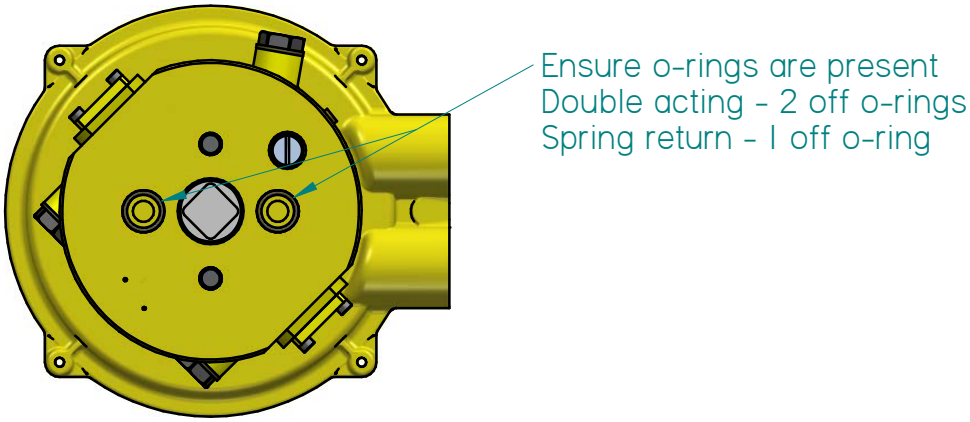
Operation

When the "UP" terminal is energised the unit will drive to the 100% end of travel stop, when the "DOWN" terminal is energised the unit will drive to the 0% end of travel stop. Energising the "MID" terminal activates the positioning function and the unit will drive to the required position demanded by one of the three methods below (selectable in "Installation Setup" SP3):-

a) 4-20mA current demand loop .
b) Potentiometer voltage.
c) Internal set point (position defined during setup).

When using 4-20mA or potentiometer the "MID" terminal can be constantly energised, with the position being adjusted by altering the 4-20mA current or potentiometer voltage. Fast to endstop or fast positioning options are available which use additional solenoids (S3 & S4 solenoid outputs) to move faster, while maintaining the positioning accuracy from the built in valves.

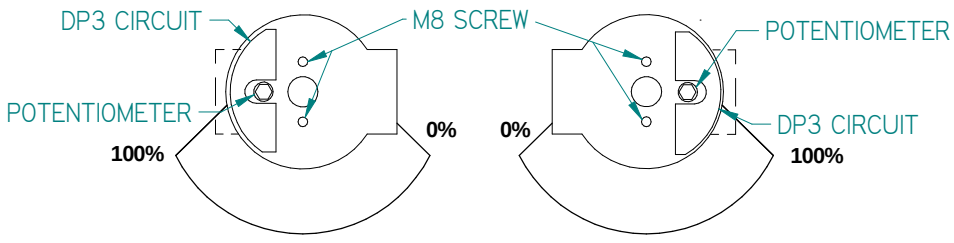
DP3 actuator direct mounting - models 05 to 15



The DP3 assembly must be mounted in the correct orientation, depending on the required position transmitter 4-20mA rising signal direction.

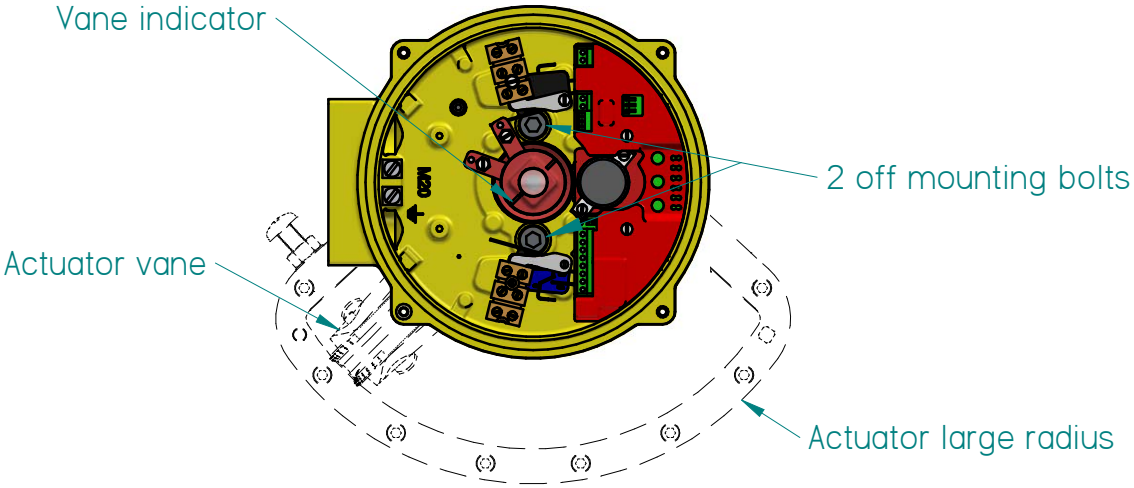
CW rising 4-20mA position transmitter SR/FD fail action ACW

ACW rising 4-20mA position transmitter SR/FD fail action CW



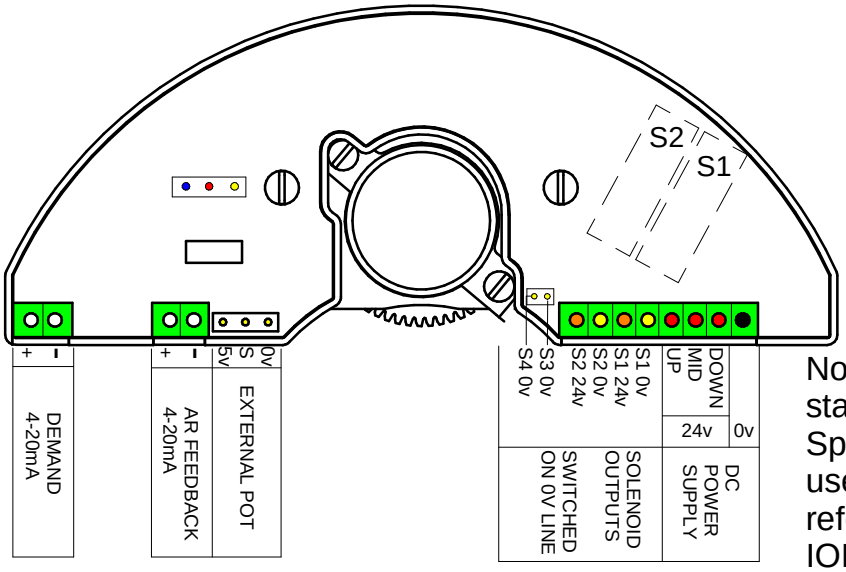
If the DP3 has been correctly ordered it will be pre-configured for the appropriate positioner type, speed, demand signal source and direction on rising signal ("Installation Setup", SP1 to SP4). If it has been supplied separate to the actuator it should be mounted so that the label reading "LARGE RADIUS" is towards the large radius of the actuator. It will then only be necessary to run SP5, SP6 and SP7 in "Installation Setup".

Mount on actuator with vane indicator in line with the actuator vane. For model 05 ensure 05/07 adaptor is used. Ensure o-rings are present under bolt heads and tighten 2 off M8 or 5/16 mounting bolts to secure to actuator.



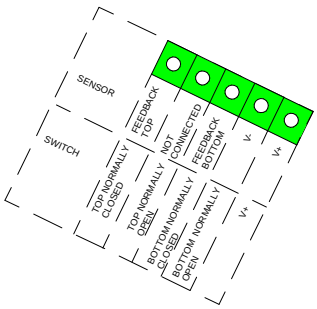
DP3 Power and signal connections

Solenoid position see note 1.
S1 - Anti clockwise when energised.
S2 - Clockwise when energised.

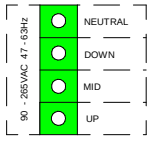


Note 1: This IOM refers to the standard positioner configuration. Special customer requirements may use a different configuration, please refer to additional product specific IOM for these details.

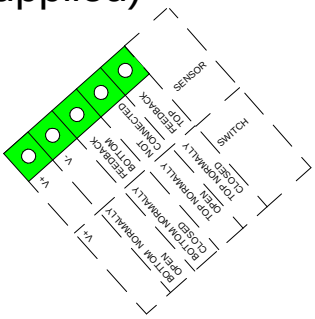
AC Power and switch connections (when supplied)



Sensor / Switch



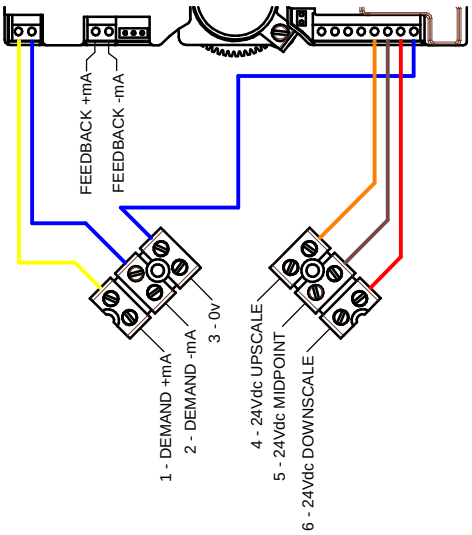
Power



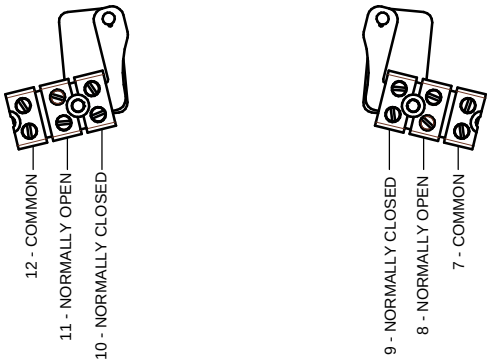
Sensor / Switch

24Vdc UNITS

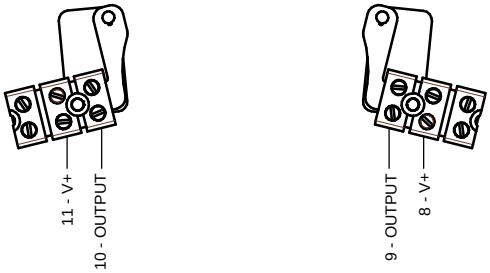
DP3 Connections



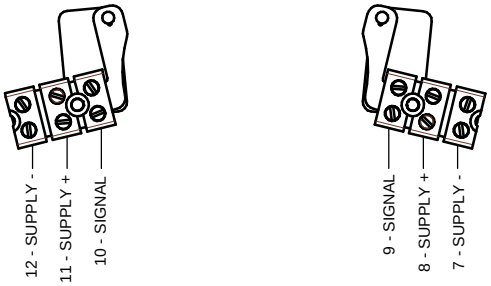
2 - SWITCHES



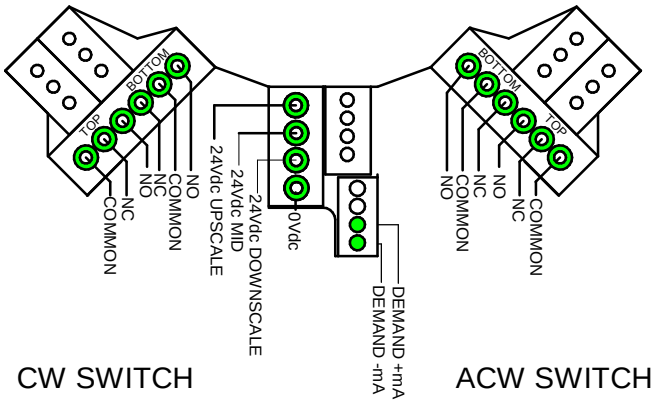
2 - 2 WIRE SENSORS



2 - 3 WIRE SENSORS

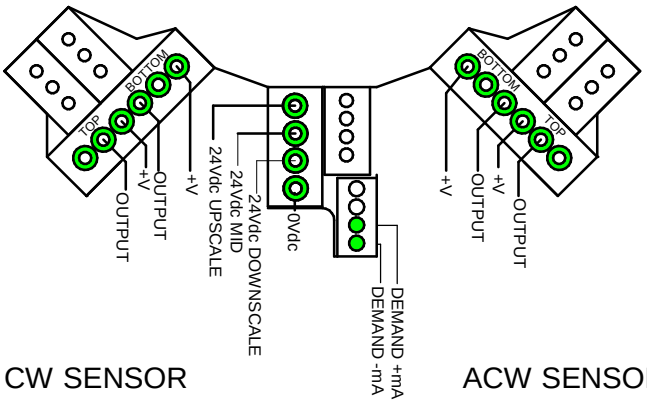


4 - SWITCHES



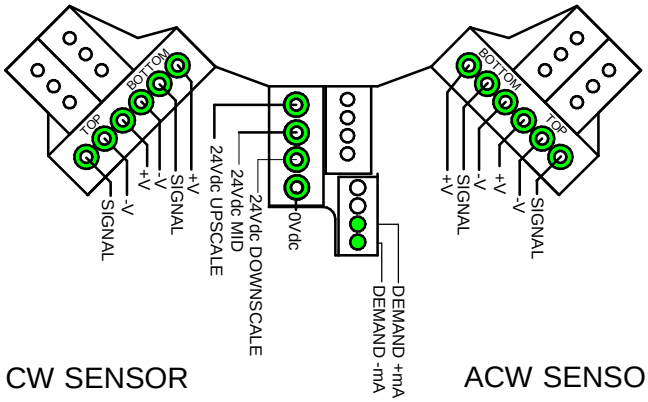
CW SWITCH ACW SWITCH

4 - 2 WIRE SENSORS



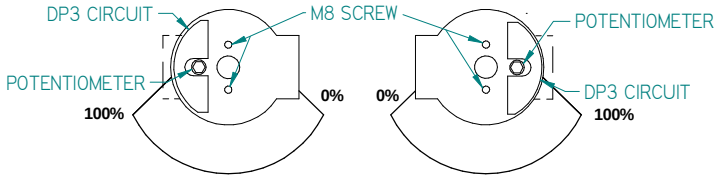
CW SENSOR ACW SENSOR

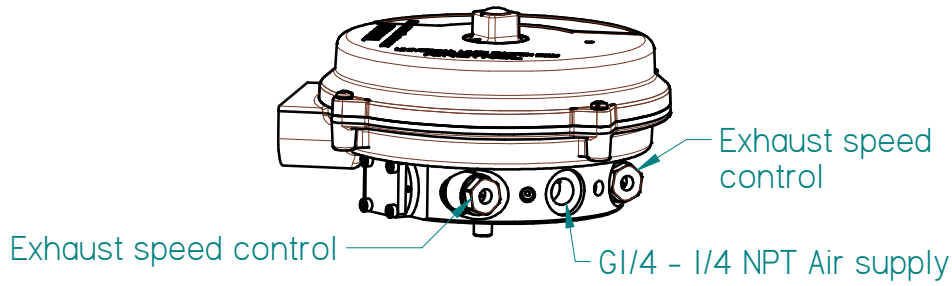
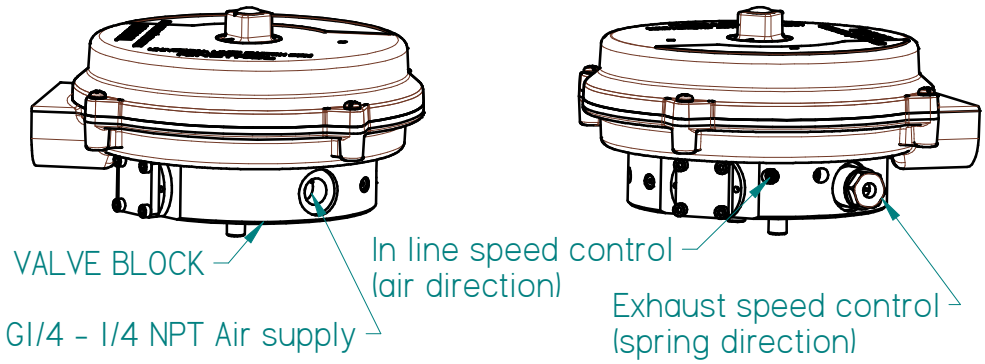
4 - 3 WIRE SENSORS



CW SENSOR ACW SENSOR

DP3 operation options for installation setup

Set-up parameter	
SP1 Select Positioner Type	The DP3 is avalable in 4 failure options in case of loss of air, power or demand signal. Valve block failure option: Fail Free / Fail Down / Fail Hold / Spring Return Loss of AIR: FREE / FREE / HOLD / DOWN Loss of POWER: FREE / DOWN / HOLD / DOWN Demand signal < 2mA: FREE / DOWN / HOLD / DOWN The failure option is defined by the valve block hardware and identified by a label, the value in setup must match the valve block fitted.
SP2 Select Positioner Speed	The DP3 comes with 2 internal solenoid valves (S1 & S2) used for precise positioning (see note 1), additional external mounted larger fast solenoid valves (S3 & S4) can be specified at ordering to increase the travel speed (only available in 24Vdc). When only internal solenoids valves are fitted this parameter should be set as Standard position Fast solenoid options (S3 & S4) can be configured as: Standard position - Fast UP or DOWN limit, when fast opening / closing is required from any point of travel. During circuit calibration the fast up & fast down mA value is set to the same value as hard up / down (SP9). Fast position - will travel fast to any point, once close to set point speed will reduce to ensure accurate positioning. Selectable fast position (an additional 24Vdc connection to the UP terminal is required) - When UP terminal = Denergised (0Vdc) - same as standard When UP terminal = Energised (24Vdc) - same as fast positioning
SP3 Select Demand Signal Source Type	Power inputs are used to select position required, DOWN / MID / UP, alternatively the DP3 can have a continuous supply on MID and alter the Potentiometer or 4-20mA to position if desired. There are 3 options for controlling the mid point of the DP3 Internal Set point - Uses an internally stored point entered during setup Potentiometer - Uses an external Potentiometer 4-20mA - Uses a 4-20mA loop
SP4 Set positioner direction and feedback potentiometer	The direction of travel with increasing position transmitter / fail down direction can be changed by rotating the DP3 control box unit on the actuator, for spring return option the spring must also be changed (see note 1). Remove M8 screws, retain 2 o-rings between actuator and valve block. CW rising 4-20mA position transmitter SR/FD fail action ACW ACW rising 4-20mA position transmitter SR/FD fail action CW  It is standard for the position transmitter to follow the demand signal, however if it is required to have the position transmitter and demand signal opposed (4-20mA v 20-4mA), this can be set in CP2.

Set-up parameter	
SP6 Set STANDARD travel time	The DP3 positioner uses a deadband zone of variable width, this is set in CP3. If the physical position of the actuator is within this deadband the positioner circuit will be satisfied and movement will cease. A narrower deadband will reduce error between demand and actual position. However if set too narrow the positioner will constantly hunt around the position required, as the smallest step possible is larger than the distance to the position required and over shoot will occur. The smallest step possible can be changed by reducing the travel speed of the positioner by adjusting the exhaust / inline speed control valves, which are located on the valve block as below (see note 1). Turn clockwise to reduce speed and anti-clockwise to increase. In order to achieve the required accuracy and travel time the correct balance is required. This setup parameter allows the speed controllers to be adjusted and actuator stroked by pressing +/- buttons to set the required travel speed.  Fail free, fail hold and fail down - 2 exhaust speed controls  Spring return - 1 exhaust speed control and 1 inline speed control Setup change will be required after speed control change (SP7).
SP7 Performance detect STANDARD	This parameter dynamically tests the actuator / load response to determine the optimal set point advance and step size throughout the stroke. It should be run as close to operational conditions as possible and re-run if standard travel times are changed.
SP8 Set FAST travel time	If SP2 is set to standard position the fast travel time does not affect the positioning speed, the fast valves will only be used when travelling to endstop value as set in CP1. This parameter will not be used. If SP2 is set to Fast position or selectable fast position, travel time is set here using speed control valves on the external fast valves. The travel time should be set as required. As the travel time is reduced the smallest fast step size is increased which will not affect the final positon achieved, but will increase the difference required between current position and demand position for the fast solenoids to be used, this is to prevent overshoot.
SP9 Performance detect FAST	This parameter is only used if SP2 is set to Fast position or Selectable Fast position. It dynamically tests the actuator / load response at high speed to determine the optimal set point advance. It should be run as close to operational conditions as possible and re-run if fast travel times are changed.

DP3 operation options for calibration setup

Calibration parameter	
CP1 Set mid point	CP1 will either set the mid point or calibate the 4-20mA demand signal depending on SP3. When SP3 is Internal set point, use the +/- buttons to position the actuator at required MID point. When SP3 is External pot this stage is omitted. When SP3 is 4-20mA, 4 calibration points are set in the order shown below by adjusting the 4-20mA demand signal to the required value and pressing S after each calibration point. 1) 0% travel value - mA signal to represent 0%. This would normally be 4mA but can be anywhere between 3mA and 21mA. 2) Hard downscale value - mA signal (or less) to force the actuator against 0% stop and used to energise fast down solenoid (when fitted) 3) Hard upscale value - mA signal (or more) to force the actuator against 100% stop and used to energise fast up solenoid (when fitted) 4) 100% travel value - mA signal to represent 100%, This would nornally be 20mA but can be anywhere between 3mA and 21mA. If position transmitter and demand signal are required to be opposed, set 0% to 20mA and 100% to 4mA. Hard downscale value should be set at 20mA end of scale and hard upscale should be set at 4mA end of scale.
CP2 Set position transmitter calibration points	Use +/- buttons to set the 4mA and 20mA position transmitter signal, these can be set between 4+/- 1mA and 20+/- 1mA. 4mA always corresponds to 0% and 20mA always corresponds to 100%
CP3 Set deadband	The DP3 positioner uses a deadband zone of variable width, this is set in CP3. If the physical position of the actuator is within this deadband the positioner circuit will be satisfied and movement will cease. A narrower deadband will reduce error between demand and actual position. However if set too narrow the positioner will constantly hunt around the position required, as the smallest step possible is larger than the distance to the position required and over shoot will occur. The smallest step possible can be changed by reducing the travel speed of the positioner by adjusting the exhaust / inline speed control valves SP6. In order to achieve the required accuracy and travel time the correct balance is required.
CP4 Set fast set point advance	Fast set point advance is set during SP9, however if the automatic settings result in fast valves hunting the set point advance can be increased using this parameter (CP4). 1 is automatic value, this can be modified by using the + & - buttons in the range 2 to 6. The minimum fast set point advance value that results in stable operation should be used, because as it increases the minimum fast step also increases.

Calibration Setup Mode Guide - CP

This mode is typically used to calibrate the DP3 operating parameters **after** the DP3 unit has been installed. (i.e. the following parameters are already set: positioner type, positioner speed, source, potentiometer, travel limits, speed restrictors and performance detect run. See Installation Setup guide on Page 6 for instructions on how to do this.)

The parameters that can be calibrated in this mode are:

1. Mid position setpoint - Can only be set when the DP3 is configured to respond to an internal set point.

2. Demand current calibration points - Can only be set when the DP3 is configured to respond to a 4-20mA current source.

3. Position transmitter calibration points

4. Deadband

TO EXIT SETUP MODE WITHOUT SAVING CHANGES PRESS & HOLD '-' & '+' — H - H + ○ S

TO FACTORY RESET PRESS & HOLD '-', '+' & 'S' for 4 seconds until all LED come on then RELEASE buttons. — H - H + H S

This RESET will restore ALL parameters in Calibration AND Installation setup to their default values as defined by (D).
After a RESET as a minimium Installation setup parameter 5 (travel stop detection) must be run.

FROM INSTALLATION SETUP
Automatic entry to calibration mode after parameter 9

FROM RUN MODE
To enter Calibration Mode: Press & Hold '+' then press 'S' then release both — ○ - H + ● S

KEY

- □ LED OFF
- ◪ LED FLASHING
- ■ LED ON
- ◪ LED ON WHEN OPTION SELECTED
- ◪ LED FLASHING WHEN OPTION SELECTED
- ○ BUTTON NOT PRESSED
- ◔ CHOOSE BUTTON TO PRESS
- ● BUTTON PRESSED
- (H) BUTTON PRESSED AND HELD

SELECT PARAMETER WITH '+' & '-' BUTTONS
PRESS 'S' TO ENTER ADJUST MODE

	PARAMETER CP:-		LED STAGE INDICATOR	SETTING DESCRIPTION	ACTION REQUIRED TO CHANGE & STORE SETTING		NOTES
1	Set mid point *(For internal setpoint mode only)*	S	G ■ □ □ □ □ □ / R ◪ □ □ □ □ □	Use '+' / '-' buttons to set mid point, actuator will move when button pressed	OR - +	Press 'S' to store	
	OR						
1	Set demand current calibration points *(For 4-20mA positioner mode only)*	S	G ■ □ □ □ □ □ / R □ ◪ □ □ □ □	Adjust 4-20mA loop current to 0% travel value	+	**Press 'S' to STORE Press '+' to SKIP**	0% demand usually 4.00mA
			G ■ □ □ □ □ □ / R □ □ ◪ □ □ □	Adjust 4-20mA loop current to hard downscale value	+	**Press 'S' to STORE Press '+' to SKIP**	Hard down demand below which actuator will be forced down (can be 4.00mA)
			G ■ □ □ □ □ □ / R □ □ □ ◪ □ □	Adjust 4-20mA loop current to hard upscale value	+ S↓	**Press 'S' to STORE Press '+' to SKIP**	Hard up demand above which actuator will be forced up (can be 20.00mA)
		S/+	G ■ □ □ □ □ □ / R □ □ □ □ □ ◪	Adjust 4-20mA loop current to 100% travel value	+	**Press 'S' to STORE Press '+' to SKIP**	100% demand usually 20.00mA
2	Set position transmitter calibration points	S	G □ ■ □ □ □ □ □ / R ◪ □ □ □ □ □	Low point set: to increase press '+', to decrease press '-'	- +	Press 'S' to store	Normally 4.00mA
			G □ ■ □ □ □ □ □ / R □ ◪ □ □ □ □	High point set: to increase press '+', to decrease press '-'	- + S↓	Press 'S' to store	Normally 20.00mA
3	Set deadband	S	G □ □ □ ◪ □ □ / R ◪ □ □ □ □ □	Increase press '+', decrease '-' 'Mid point' terminal must be powered	- + S↓	Min = 1, Max = 20 Press 'S' to store	R1 flashes to count setting R3 flashes to indicate start of R1 count
4	Set fast set point advance Only when installation parameter 2 is set to fast / selectable fast position	S	G □ □ □ □ □ □ / R ◪ ◪ ◪ ◪ ◪ ◪ SET POINT ADVANCE SETTING 1 to 6 (D)	Increase press '+', decrease '-'	- + S↓	Press 'S' to store	Fast SF setting default is 1. If the positioner hunts with the fast solenoids (after setting installation parameter 9), fast set point advance should be increased.
5	PRESS '+' TO LEAVE CALIBRATION MODE AND ENTER RUN MODE. FOR RUN MODE DESCRIPTION, SEE PAGE 7				ALL LIGHT FLASH ONCE WHILE SAVING SETTINGS THEN ENTERS RUN MODE		

Installation Setup Mode Guide - SP

To enter Installation Setup Mode: Press & Hold '-' then press 'S' then release both. (H - + S)

R6 will light continuously in Installation Setup Mode

KEY

- LED OFF
- LED FLASHING
- LED ON
- LED ON WHEN OPTION SELECTED
- LED FLASHING WHEN OPTION SELECTED

- BUTTON NOT PRESSED
- CHOOSE BUTTON TO PRESS
- BUTTON PRESSED
- BUTTON PRESSED AND HELD

TO EXIT SETUP WITHOUT SAVING CHANGES PRESS & HOLD '-' & '+' (H - H + S)

TO FACTORY RESET PRESS & HOLD '-', '+' & 'S' see page 5 for details (H - H + H S)

PRESS 'S' TO ENTER ADJUST MODE

SELECT PARAMETER WITH '+' & '-' BUTTONS

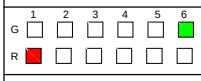
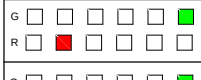
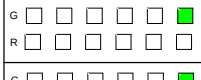
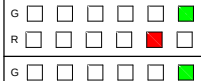
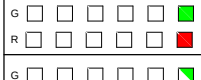
Only when (2) is set to fast / selectable fast position

	PARAMETER SP:-	PRESS 'S' TO ENTER / EXIT ADJUST MODE	LED STAGE INDICATOR	SETTING DESCRIPTION	ACTION REQUIRED TO CHANGE SETTING		NOTES
	1 Select Positioner Type	S	1 2 3 4 5 6 G R	Fail free / Fail hold (D)	OR - +	Use + / - buttons to select required source	
				Fail down / Spring return			
	2 Select Positioner Speed	S		Standard position (D)	OR - +	Use + / - buttons to select required source	Fast position requires 4 solenoids and is ordered as an option
				Fast position			Apply 24vdc to UP terminal when fast position required
				Selectable fast position			
	3 Select Demand Signal Source Type	S		1 - Internal set point	OR - +	Use + / - buttons to select required source	
				2 - External Potentiometer			
				3 - 4-20mA (D)			
	4 Set positioner direction and feedback potentiometer	S		Check physical arrangment. CW rising 4-20mA position transmitter SR/FD fail action ACW: DP3 CIRCUIT, M8 SCREW, POTENTIOMETER, 100%, 0%. ACW rising 4-20mA position transmitter SR/FD fail action CW: POTENTIOMETER, M8 SCREW, DP3 CIRCUIT, 0%, 100%		Loosen feedback pot screws by approx. 1/2 turn to ensure nut on underside is retained, then rotate pot. (Pot screw, Potentiometer, Pot screw) Rotate potentiometer slowly (direction is not important) to move actuator to midpoint +/- 20º. At this point pot is set.Tighten pot screws and press 'S'	
				Positioner set to travel CLOCKWISE on rising feedback (D)	-	Use - button to select required direction	If positioner fails to travel to mid point after potentiometer has been rotated by 1 turn ensure correct direction is selected
				Positioner set to travel ANTI-CLOCKWISE on rising feedback			
	5 Detect travel stop positions	S		Endstop 1 detect LOW	WAIT UNTIL FINISHED	Moves to endstop 2 when finished	AUTOMATIC
				Endstop 2 detect HIGH		R2 stops flashing when finished	AUTOMATIC
	6 Set STANDARD travel time	S		Adjust pneumatic restrictors to give required travel time, pressing +/- moves actuator to test travel time	OR - +		Slower travel times will allow smaller deadband & more accurate positioning
	7 Performance detect STANDARD	S		This should be run when the load charactristics or standard speed of travel have changed	WAIT UNTIL FINISHED	Actuator tests dynamic response. R1stops flashing when finished	AUTOMATIC Takes 4 minutes
	8 Set FAST travel time	S		Adjust pneumatic restrictors to give required fast travel time, pressing +/- moves actuator to test travel time	OR - +	Fast travel time should be set as required, this does not affect the accuracy of the posisioner. However as the fast travel time is reduced the smallest fast movement possible is also reduced, causing the positioner to travel at standard speed.	
	9 Performance detect FAST	S		This should be run when the load characteristics or fast speed of travel have changed	WAIT UNTIL FINISHED	Actuator tests dynamic response. R1stops flashing when finished	AUTOMATIC
	10	PRESS '+' TO LEAVE INSTALLATION SETUP MODE AND ENTER CALIBRATION MODE. FOR CALIBRATION MODE DESCRIPTION, SEE PAGE 5					

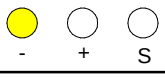
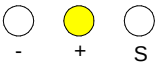
Run guide

In run mode the following light will be illuminated to show the status of the unit.
G6 is a constant status light which shows the unit is in run mode,
if G6 flashes the installation setup has not been completed.

R1/2/5/6 is a constant light that shows which solenoid is active:

KEY: □ LED OFF, ■ LED ON, ◪ LED FLASHING, ▨ LED ON or OFF	RUN MODE
	HARD / FAST UPSCALE SOLENOID
	UPSCALE SOLENOID
	NO SOLENOID
	DOWNSCALE SOLENOID
	HARD / FAST DOWNSCALE SOLENOID
	INSTALLATION PARAMETER 5 HAS NOT BEEN RUN, POSITIONER WILL NOT FUNCTION UNTIL INSTALLATION HAS BEEN RUN

Manual positioner control via - / + buttons

	PRESS - Move actuator downscale
	PRESS + Move actuator upscale