Saunders

Module

Installation, Operation and Maintenance Instructions

Crane Process Flow Technologies Ltd

Grange Road, Cwmbran, Gwent, U.K. NP44 3XX
Telephone +44 (0) 1633 486666, Telefax +44 (0) 1633 486777, www.craneflow.com

CRANE

Saunders Module

Valve Monitoring and Control Unit

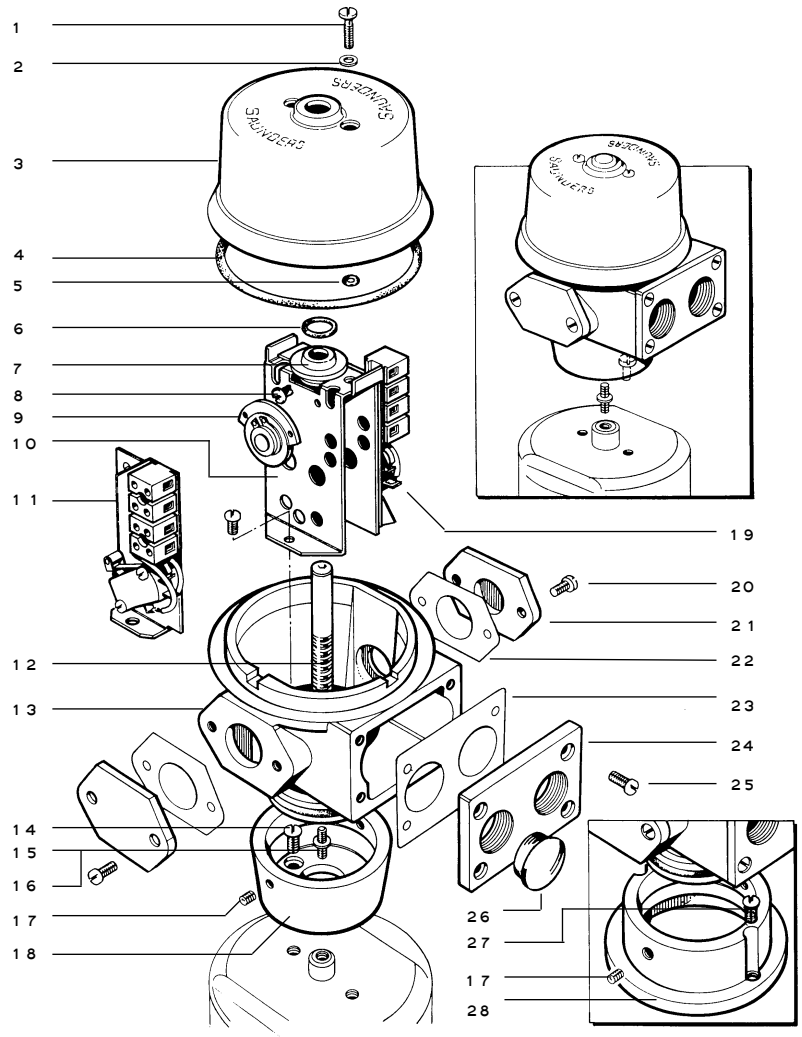
The Saunders 'Module' is a unique position monitoring and control unit designed for use with the Saunders EC and ECX actuated diaphragm valves.

Suitable for use in extreme environmental conditions, the 'Module' with its robust, modular construction offers a wide variety of switch and solenoid control options to suit all applications.

The 'Module' incorporates the following features:

- Robust modular construction.
- Corrosion resistant coating suitable for use in severe environmental conditions.
- Extensive range of switches and sensors.
- IP67 (NEMA 6) Enclosure protection.
- Optional 'onboard' pneumatic control.
- Visual Indication.
- Ease of adjustment.
- Mounting - 0 to 360° orientation.

Item	Component
1	Cover screw
2	Sealing washer
3	Cover
4	Cover 'O' ring
5	Cover screw retaining 'O'ring
6	Indicator seal
7	Indicator bearing
8	Switch bracket retaining screw
9	Cam assembly
10	Main support bracket
11	Switch bracket assembly (Left hand)
12	Indicator
13	Enclosure base
14	Mounting ring screw
15	Indicator mounting screw
16	'O' ring
17	Base locking screw
18	Mounting ring (DN8-25)
19	Switch bracket assembly (Right hand)
20	Side entry plate screw
21	Side entry plate
22	Side entry plate gasket
23	Main entry plate gasket
24	Main entry plate plate
25	Main entry plate screw
26	Conduit plug
27	Mounting ring screw
28	Mounting ring (DN 40-50)



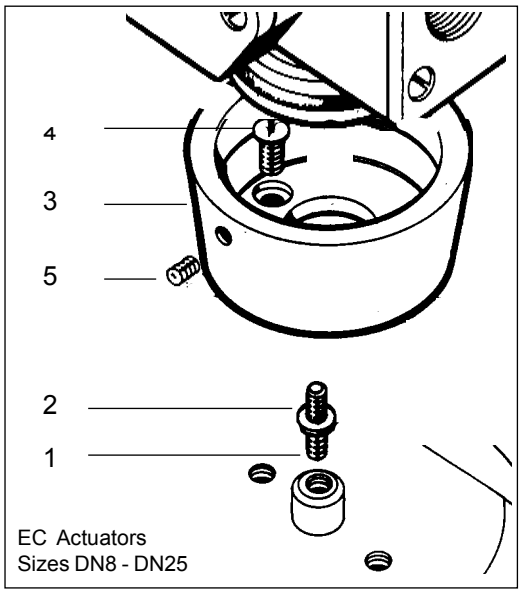
Technical Specification.

Enclosure	:	Die Cast Aluminium
Seals	:	Nitrile
Finish	:	Polyester Resin Coating (Internal and External)
Switch Type	:	V3 Micro switch V3 Inductive proximity (NAMUR) (For further switch options contact Saunders Sales Department)
Enclosure Rating	:	IP67 - NEMA 6
Temperature	:	-10°C to +80°C (Not suitable for autoclave sterilization).
Weight	:	700gms
Dimensions	:	Diameter 95mm Height 115mm (Add to closed actuator height)
Conduit Thread	:	M20, PG13,5, 1/2"NPT
Pneumatic Control	:	5/2 or 3/2.
Solenoid Voltage	:	12Vdc to 240Vac (Non I.S) 12/24Vdc (I.S)

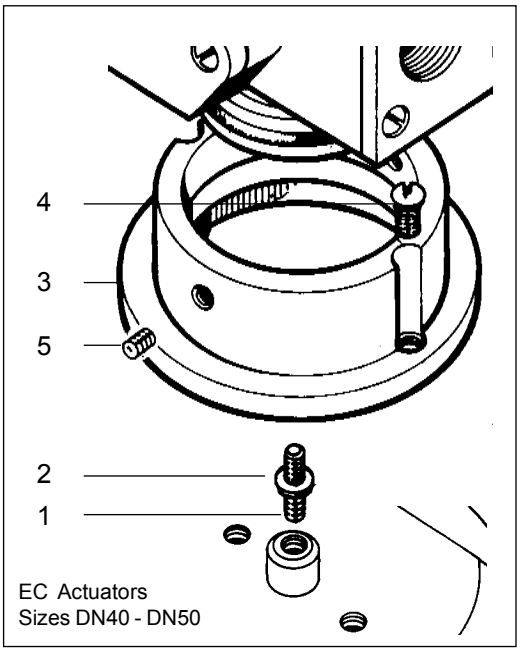
Module Mounting and Removal.

Mounting to EC Actuators - Sizes DN8 - DN25

1. Thread the M4 Indicator mounting screw (1) into the actuator indicator.
2. Place the 'O'ring (2) over the screw (1).
   Note: Do not apply lubricant to the 'O' ring.
3. Fasten the mounting ring (3) to the actuator with the two (M4) screws (4).
4. Mount the Module onto the ring (3) rotating the unit until the conduit entries are in the required position.
5. Tighten the two (M5) locking screws (5) located in the wall of the mounting ring (3)
6. Push the indicator down into the Module until it meets with the indicator mounting screw (1). Tighten the indicator onto the mounting screw (1), turning the indicator by means of a M3 hexagonal key placed in the indicator retaining screw on top of the indicator.



EC Actuators
Sizes DN8 - DN25



EC Actuators
Sizes DN40 - DN50

Mounting to EC Actuators - Sizes DN40 - DN50

1. Proceed as instructed in 1 to 6 the above. *(Mounting to DN8 - DN25 actuators)*.

Removal of the 'Module' from the Actuator Sizes DN8 - DN50

1. **IMPORTANT.** Do not remove the Module with the signal cables connected, unless the electrical supply has been isolated.
2. Unfasten the indicator from the screw (1)
   This may be achieved with or without the Module's cover in place.
3. Loosen the two locking screws (5) sufficient to allow the Module to be lifted clear of the mounting ring (3)
   Note: The locking screws (5) are not held captive in the mounting ring.
4. Remove the mounting ring retaining screws (4) and mounting ring (3)
5. Remove the indicator mounting screw (1) complete with 'O' ring (2).

Switch Actuation and Setting

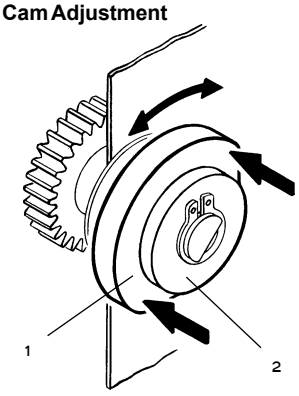
The Saunders Valve is usually supplied with the Module already fitted and set. However throughout the life of the valve, it may be necessary to reset the switches particularly after changing a diaphragm, on receiving an actuator sub-assembly only (no body fitted) or after removal of the switch unit for autoclaving.

The onboard switches or sensors are actuated by cams which rotate as the actuator moves through its stroke. The linear movement of the actuator indicator is converted to rotary motion at the cams via a rack and pinion drive. Cam positions may be set independently allowing either switch to indicate the open and closed status of the valve.

The cam actuating the left hand switch (Terminals 1 to 4) rotates in an anti-clockwise direction when the valve actuator moves from the closed to open position. The cam actuating the right hand switch (Terminals 5 to 8) rotates in an anti-clokwise direction when the valve moves from the open position to the closed position.

The cams and their respective hubs have splines which engage for positive drive of the cam. A spring is located between the cam and the inner main support bracket holding the cam in position on its spline. To adjust the position of the cam move the cam towards the centre bracket disengaging the spline. Rotate the cam to the required position and release allowing the spring to return the cam back onto the spline.

Cam Adjustment



Switch setting - Micro switches (Type M1, M2, M3 and M5)

Left hand switch bracket (Terminals 1 to 4)

1. With the actuator mounted on the valve and the valve in the closed position rotate the cam (1) on its hub (2) in a clockwise direction until the rise of the cam has made contact with the switch roller and the contact has changed state (Common and normally open contact connected).The change of electrical state should be checked with a continuity test unit or ohm meter. Double acting and 'fail open' spring return actuators require air pressure to be applied to the upper chamber of the actuator to affect valve closure.

Right hand switch bracket (Terminals 5 to 8)

2. Actuate valve to the open position applying air pressure to the lower chamber of the 'failsafe close'and 'double acting' units.
3. Rotate the cam (1) in a clockwise direction until the rise of the cam has made contact with the switch roller and the contact has changed state (Common and normally open contact connected)

Switch setting - Proximity switches

When setting cam positions for proximity switches a suitable sensor test unit should be used. For further details on switch test equipment contact Saunders Sales Office.

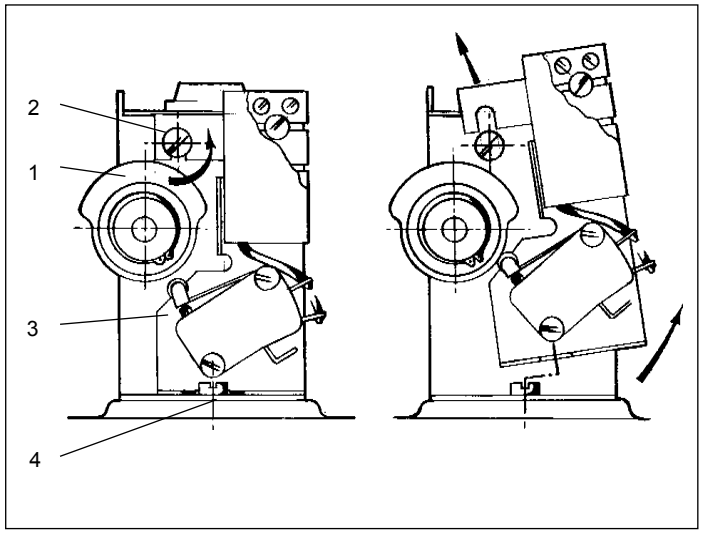
Switch / Terminal Bracket Removal and Replacement

Switch Bracket Removal

1. Rotate the switch actuation cam (1) until the minor diameter of the cam is adjacent to switch roller or the target face of the sensor.
   Note: DO NOT loosen the screws fastening the cam support hub to the gear spindle.
2. Loosen the captive switch bracket retaining screw(2).
3. Lift the switch bracket (3) from the unit disengaging the bracket locating hole from the head of the primary bracket retaining screw (4).

Switch Bracket Replacement

1. Rotate the cam (1) until the rise of the cam is positioned towards the top of the unit.
2. Loosen the captive switch bracket retaining screw(2).
3. Place the switch bracket (3) over the primary bracket retaining screw (4) and the switch bracket retaining screw (2) and tighten (2).
4. Set cams to the required position.



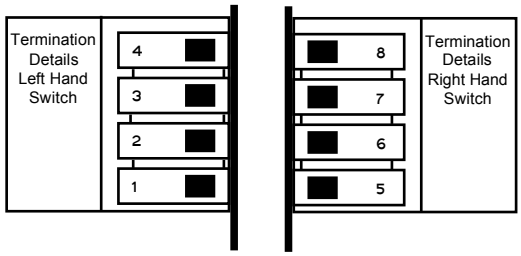
Electrical Termination

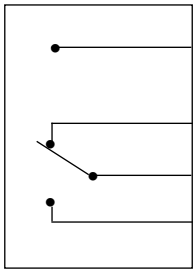
The 'Module' is available with V3 format micro switches, proximity switches or pneumatic switches, each variant of switch mounted on a modular switch bracket.

Terminal strips are numbered 1 to 4 and 5 to 8. Termination details are provided on insulation cards adjacent to each terminal strip on all switch bracket assemblies with the exception of the M5 Flameproof option.

The M5 flameproof switch variant has flying cables, the three cores colour coded White- Common, Green - Normally Closed and Brown - Normally Open.

Switch brackets fitted with certified 'intrinsically safe' proximity switches have BLUE terminal strips.





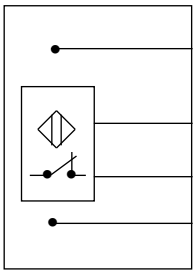
Terminal 4 Optional Solenoid +ve
Terminal 8 Optional Solenoid -ve

Terminal 3 & 7 Normally Closed *(Blue)* M1, M2
Normally Open *(Red)* M3

Terminal 2 & 6 Common *(Yellow)*
M1, M2, M3

Terminal 1 & 5 Normally Open *(Red)*
M1, M2, M3

Module Termination Details
Switch Options - M1 & M2 - V3 S.P.D.T
M3 D.P.S.T Mechanical Switches



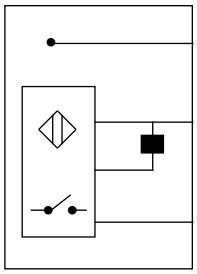
Terminal 4 Optional Solenoid +ve
Terminal 8 Optional Solenoid -ve

Terminal 3 & 7 P2 & P9 +ve *(Brown)*
P8 +ve N/C, -ve N/O *(Black)*

Terminal 2 & 6 P2 & P9 -ve *(Blue)*
P8 -ve N/C, +ve N/O (White)

Terminal 1 & 5 *(Not Connected)*

Module Termination Details
Switch Options - P2 , T2, P8 & P9 Inductive Proximity Switches



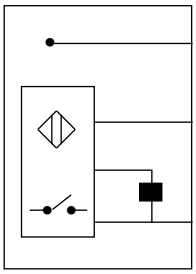
Terminal 4 Optional Solenoid +ve
Terminal 8 Optional Solenoid -ve

Terminal 3 & 7 +ve *(Brown)*

Terminal 2 & 6 Load *(Black)*

Terminal 1 & 5 -ve *(Blue)*

Module Termination Details
Switch Options - P6, T6 Inductive Proximity Switches



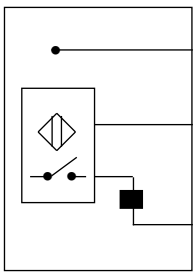
Terminal 4 Optional Solenoid +ve
Terminal 8 Optional Solenoid -ve

Terminal 3 & 7 +ve *(Brown)*

Terminal 2 & 6 Load *(Black)*

Terminal 1 & 5 -ve *(Blue)*

Module Termination Details
Switch Options - P7, T7 Inductive Proximity Switches



Terminal 4 Optional Solenoid +ve
Terminal 8 Optional Solenoid -ve

Terminal 3 & 7 +ve *(Brown)*

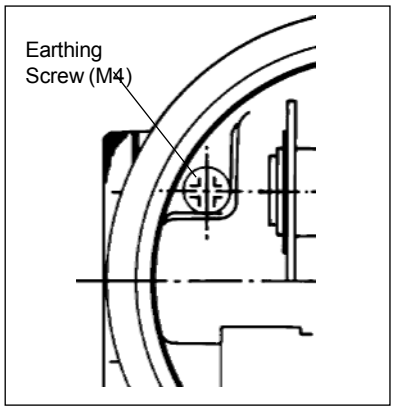
Terminal 2 & 6 *(Not Connected)*

Terminal 1 & 5 -ve *(Blue)*

Module Termination Details
Switch Options - T5 Normally Open Contact
Alternating Current Proximity Switches

Earth Bonding

An earth terminal (M4) is provided on the inner wall of the Module's enclosure adjacent to the secondary gland plate. When connecting the earth conductor ensure that it is positioned clear of the switch actuating cam.



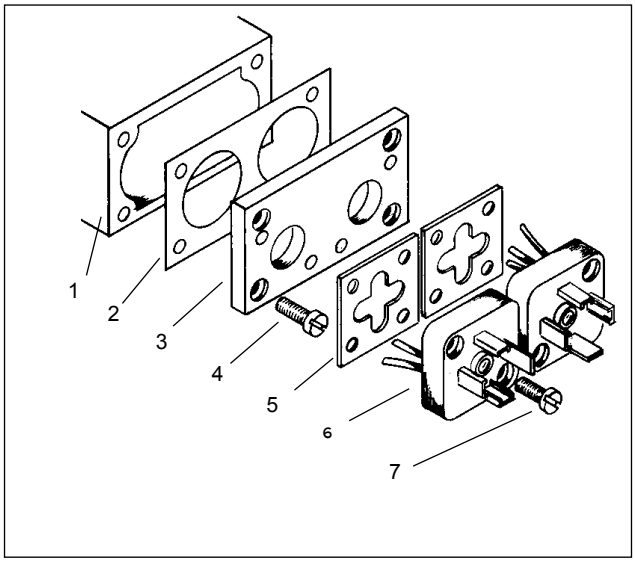
Autoclaving

The Module must be removed before actuator autoclaving is carried out.

Plug and Socket Electrical Termination (DIN 43650)

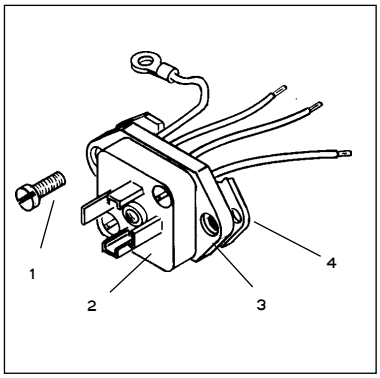
Main Entry DIN Connector Installation

1. Remove the main entry plate and gasket.
2. Fit the DIN plug mounting plate (3) and gasket (2) with the four M4 screws provided.
3. Pass the leads of the plugs (6) throught the plug gaskets (5) and the mounting plate and base assembly (1,2 and 3).
4. Fasten the DIN plugs (6) to the mounting plate (3) with the M3 screws provided (7)
5. Terminate the plug leads as follows.
   Left Hand Plug:
   Green lead to earth.
   Red lead (pin 1) to terminal 1
   Yellow lead (pin 2) to terminal 2
   Blue lead (pin 3) to terminal 3
   Right Hand Plug:
   Green lead to earth.
   Red lead (pin 1) to terminal 5
   Yellow lead (pin 2) to terminal 6
   Blue lead (pin 3) to terminal 7



Side Entry DIN Connector Installation

Side entry DIN plugs are available as an alternative to threaded conduit plates when the pneumatic control valve Module is fitted. The side entry DIN connector kit comprises of a three pin plug which is fitted to the left hand side of the Module (viewed from the front), used to terminate the solenoid and a four pin plug used to terminate the switches, fitted to the right hand side of the Module. The plugs are supplied preassembled to the side plates.



1. Remove the two blank side entry plates and gaskets.
2. Pass the leads of the plug through the gasket (4) and through the wall of the Module.
3. Fasten the side entry plate (3) and gasket (4) to the Module with the M4 screws (1).
4. Terminate the leads as follows

Left Hand (Three Pin) Plug
Green to earth
Brown (Pin 1) to terminal 4
Blue (Pin 2) to terminal 8

Right Hand Plug
Red (Pin 1) to terminal 1 (N/O switch contact) or to terminal 3 (N/C switch contact and P2).
Yellow (Pin 2) to terminal 2.
White (Pin 3) to terminal 5 (N/O switch contact) or to terminal 7 (N/C switch contact and P2)
Black (Pin E ⏚) to terminal 6.

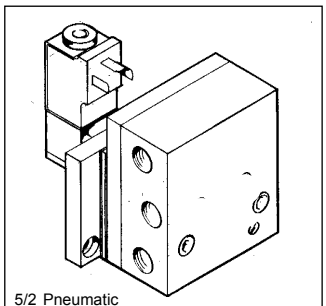
Pneumatic On/Off Control Valve Module

A range of pneumatic On/Off control valve Modules are available extending the application of the 'Module' to provide pneumatic control of EC and ECX actuated valves in addition to position monitoring.

The 5/2 pneumatic control valve Modules are available with solenoids ranging from 12Vdc to 240Vac including a 12V/24Vdc 'Intrinsically Safe' option.

A simple 3/2 manifold version of the Module is available for use with spring return actuators.

For details of actuator operating speeds and solenoid electrical specifications please contact Saunders Sales Office.

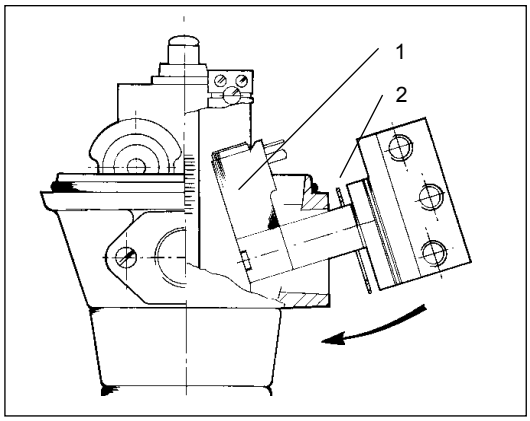


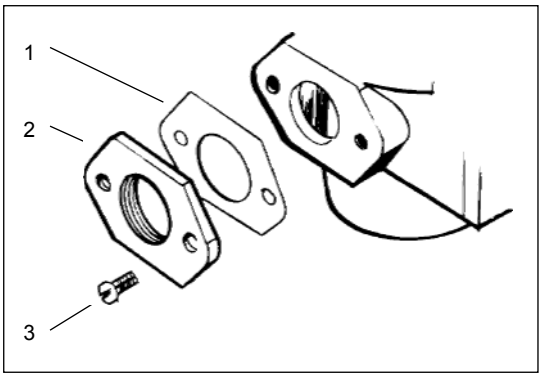
5/2 Pneumatic Valve Module

Pneumatic Valve Installation

Step 1 - Valve Block Installation

1. Remove the Module's cover.
2. Remove the main entry plate and gasket (Items 23 and 24 page 1).
3. Pass the solenoid valve (1) throught the main entry port ensuring the sealing gasket (2) is in place between the enclosure base and the pneumatic control block mounting plate.
   The pilot solenoid valve is positioned between the two internal support brackets.
4. Fasten the valve mounting plate to the base with the four M4 screws provided.



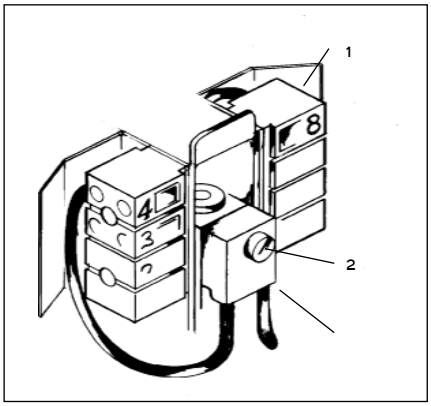


Step 2 - Fitting the Side Entry Plate

1. Remove one or both of the side entry cover plates and gaskets on the side of the Module. (Items 21 and 22 - page 1).
   The second side entry plate may be required when the solenoid driver and feedback switch circuits are connected to the Module via seperate cables.
2. Replace the cover plate(s) with a side entry plate (2) and gasket (3). Two M4 screws are provided (3).
   Note: Conduit entry plates are available with M20 x 1.5, PG13,5 or 1/2" NPT thread forms.
3. When passing cables through the side entries ensure that the conductors are positioned clear of the switch actuating cams.

Step 3 - Solenoid Termination. (Non I.S Solenoids without flying leads)

1. Fit the connector (2) over the solenoid connection pins.
2. Secure the connector to the solenoid coil with the screw provided (3).
3. Connect the left hand flying lead to the rear of terminal 4 as indicated on the terminal insulation card (1).Ensure that the lead is positioned between the terminal strip and the insulator card.
4. Connect the right hand flying lead to the rear of terminal 8, again as indicated on the terminal insulation card.

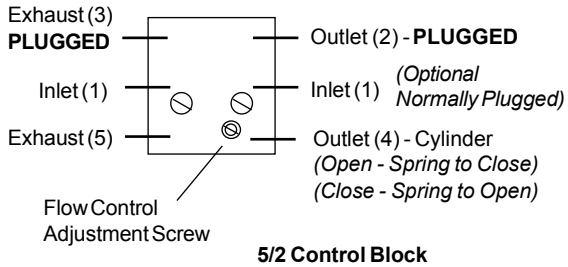


Step 3 - Solenoid Termination. (I.S Solenoids)

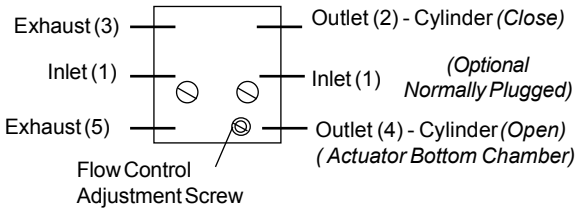
1. The connector supplied with the intrinsically safe solenoid is fitted to the solenoid coil in the reverse position to the Non I.S assembly, i.e. with its flying leads projecting from the top of the connector.
2. The left hand conductor is connected to the rear of terminal 4 and the right hand connector is terminated to the rear of terminal 8 as above.

Note: DO NOT pass the conductors over the top of the terminal strip as they may be trapped by the cover when fitted.

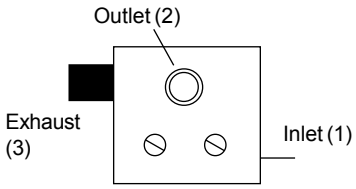
Pneumatic Connections.



5/2 Control Block
Single Acting - Spring Return Actuators



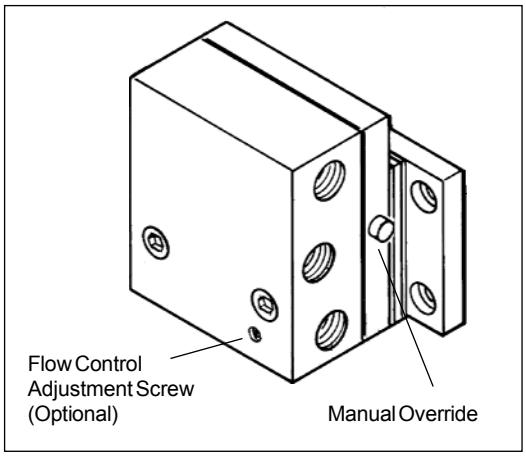
5/2 Control Block
Double Acting Actuators



Manifold Block
Single Acting Actuators

Speed Control.

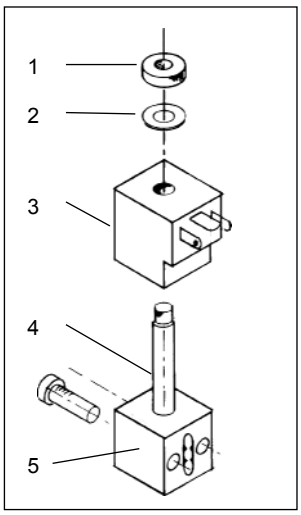
A pneumatic flow adjustment screw is optional on 5/2 control valves. In single acting (spring return) applications the flow of air to and from the actuator is regulated. In double acting applications the flow is regulated through port 4 only (normally closed poppet).
Speed control is not incorporated in the 3/2 manifold valve.



Manual Override

Manual override is provided on 5/2 pneumatic control blocks, the red actuating plunger being located in the wall of the valve coverplate as illustrated.

To operate the manual override press the red actuating plugger firmly. Releasing the spring loaded plunger will return the block to solenoid control.



Solenoid Coil Replacement (Non I.S Solenoid Coils)

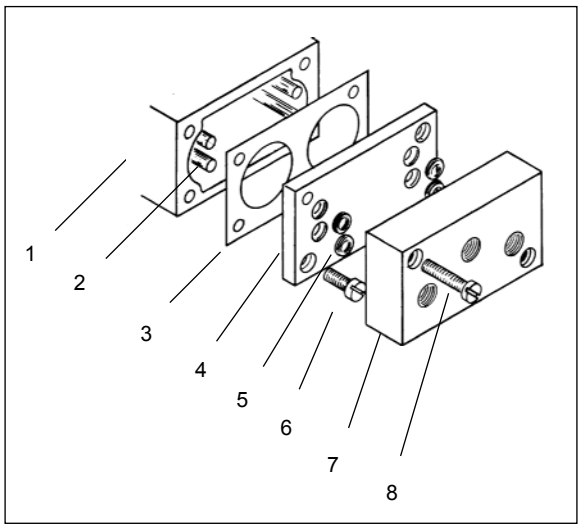
1. The non I.S pilot solenoid valve comprises of a pneumatic sub base (5) and a removable coil (3). A common pneumatic base is used with all coil voltages from 12Vdc to 240Vac facilitating conversion to different coil voltages and replacement of coils in the event of failure.
   IMPORTANT. Before attempting to remove the solenoid valve from the Module or before removing the coil from the pneumatic sub-base, ensure that the electrical supply to the solenoid and switches has been isolated.
2. Remove the knurled retaining nut (1) and locking washer (2).
3. Remove the coil from the core pin (4).

When replacing the coil proceed in reverse order. Ensure that the coil is seated correctly on the base, the locking washer (2) is in place and the retaining nut (1) is tight. Do not overtighten the retaining nut as damage to the sub base core pin may result.

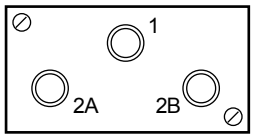
Note: On later models the coil may either be held in place by a circlip in place of retaining nut (1). Alternatively the valve may have a coil which snaps intoplace without the need for nut or circlip.

Pneumatic Switch Installation

1. Remove the main entry plate and gasket
2. Mount the left and right hand pneumatic switch bracket in accordance with the instructions given on page 2 'Switch Terminal Bracket Removal and Replacement'.
3. Fasten the sealing plate (4) and gasket (3) to the base of the 'Module' with the two M4 screws provided (6) ensuring the pneumatic switch connection tubes (2) pass throught the sealing plate.
4. Place the four 'O' ring seals (5) over the ends of the pneumatic tubes (2) and into the counter bores on the face of the sealing plate (4).
5. Fasten the interface plate (7) to the 'Module' with the two M4 screws (8).



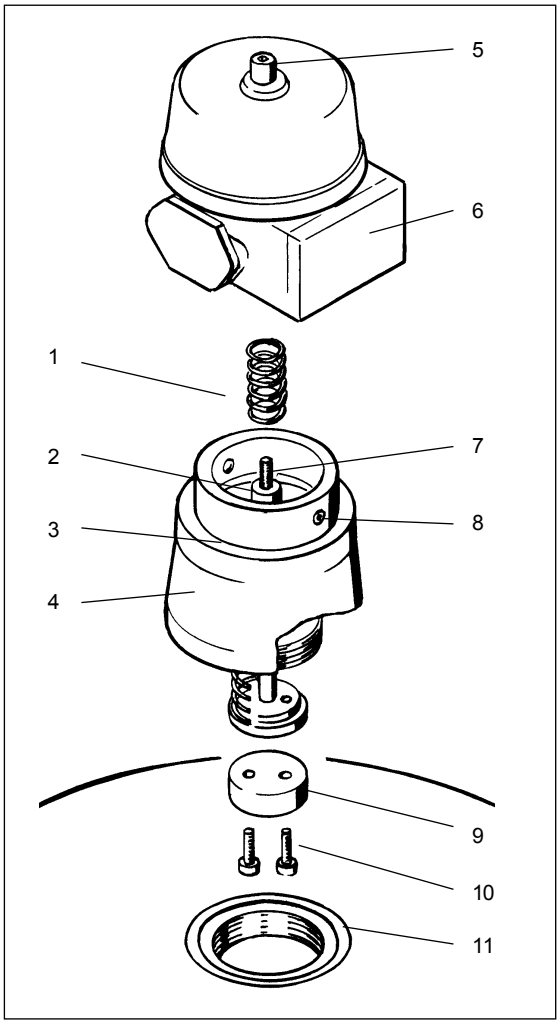
Pneumatic Connections



Common Inlet (1)

Outlet (2A) *(Left Hand □□□□□□)*

Outlet (2B) *(Right Hand Switch)*



ECX Module Adaptor

Mounting

1. Select the appropriate spacer(s) (9) as necessary indicated in the selection charts on page 10. Fasten the spacer to the adaptor thrust disc with the M3 screws provided (10).
   IMPORTANT: Two sets of screws are provided in the ECX H spacer kits to accomodate the different length and combinationof spacers. Select the correct length screw to ensure the spacer is correctly secured
2. Place the balance return spring (1) over the lost motion coupling (2).
3. Mount the Module (6) onto the adaptor mounting ring (3) securing the unit with the two M5 socket set screws (8).
4. Fasten the Module spindle (5) onto the M4 screw projecting from the lost motion coupling using a 3mm hexagon key.
5. Remove the actuators indicator shroud and indicator leaving the indicator 'O' ring (11) in position.
6. Move the actuator to the fully open position.
7. Screw the Adaptor (4) and Module onto the actuator.
8. Ensure that the Adaptor sits flush on the top of the actuator i.e. full thread engagement is achieved. A small gap of less than 1mm is present to ensure o'ring compression.
9. If a large gap is present, measure the distance. This will need to be accommodated by adjusting the spacer combination fitted to the adaptor thrust disc. Select an alternative spacer and repeat the process.
10. To ensure correct operation, pull on the yellow indicator.Upward movement indicates that additional travel is still available via the lost motiom coupling and this will accommodate any slight variations in travel.
11. Slacken the two M5 Module retaining set screws (8) and rotate the Module until the conduit entry is in the desired position. Retighten the two screws .

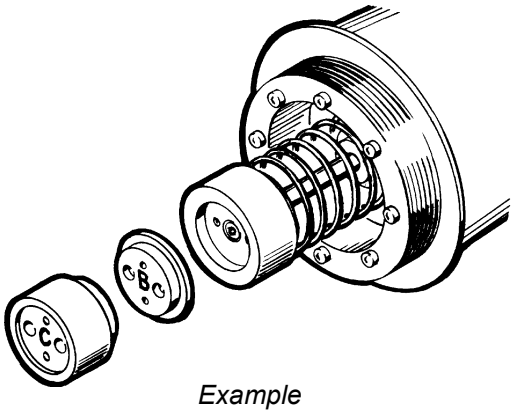
Removal.

1. To facilitate removal of the adaptor from the actuator it may be necessary to use a suitable strap placed around the base of the adaptor to provide sufficient grip.

ECX Module Adaptor - Spacer Selection

ECX Spacers

Actuator Size	*Type*	*Series*	*Adaptor Kit*	*Spacer (Height mm)*
DN65	S/O	S	A	X No Spacer
DN65	S/C	F&G	A	A(6,0)
DN65	D/A	S	A	C(21,9)
DN80	S/O	S	B	X No Spacer
DN80	S/C	F&G	B	X No Spacer
DN80	D/A	S	B	B (12,6)
DN100	S/O	S	B	X No Spacer
DN100	S/C	F&G	B	A(6,0)
DN100	D/A	S	B	A(6,0)
DN100	S/O - Rubber	H	C	D (1,5)
DN100	S/O - 214	H	C	E (4,5)
DN100	S/C - Rubber	H	C	E+G (20,0)
DN100	S/C - 214	H	C	E+G (20,0)
DN100	S/C - H4-214	H	C	E+F (22,0)
DN100	S/C - H5-214	H	C	E+F (22,0)
DN100	D/A - Rubber	H	C	D (1,5)
DN100	D/A - 214	H	C	E (4,5)
DN125	S/O - Rubber	H	C	E (4,5)
DN125	S/O - 214	H	C	E (4,5)
DN125	S/C - Rubber	H	C	E+G (20,0)
DN125	S/C - 214	H	C	E+G (20,0)
DN125	S/C - H5-Rubber	H	C	E+F (22,0)
DN125	S/C - H5-214	H	C	E+F (22,0)
DN125	D/A - Rubber	H	C	X No Spacer
DN125	D/A - 214	H	C	D (1,5)
DN150	S/O - Rubber	H	C	D (1,5)
DN150	S/O - 214	H	C	D (1,5)
DN150	S/C - Rubber	H	C	F(13,5)
DN150	S/C - 214	H	C	F(13,5)
DN150	D/A - Rubber	H	C	X No Spacer
DN150	D/A - 214	H	C	X No Spacer



Example
DN100 SC-H4-214

Note: The spacer letter referred to in the table and diagram is stamped on the face of the spacer. This letter must face away from the adaptor when assembled. The adaptor kit letter referred to in the table is cast inside the top of the adaptor.