



The P3 On/Off positioner consists of an electronic positioning circuit mounted in a robust all-metal enclosure, which controls a ¼-turn rotary pneumatic actuator via standard on-off solenoid valves which are direct-mounted on the actuator's own interface.

The P3 circuit is designed so that its assembly can be mounted inside a standard Kinetrol limit switch box (either ULS-type, or explosion proof XLS-type), using only two screws. The P3 assembly includes a feedback potentiometer and anti-backlash gear drive, which engages with gear teeth on the limit switch coupling, to read the actuator's position. The limit switch coupling, complete with gear teeth, needs to replace the standard coupling if a standard box is being retrofitted with a P3.

The positioner circuit is powered by the mid-point input voltage. It functions by comparing the actual mid-point position (read by the feedback potentiometer) with the set position (set via an on-board preset or a remote preset or a remote 4-20mA signal). The positioner circuit uses its solid-state switched outputs to power solenoid valves which drive the actuator towards the position where the set position corresponds with the actual position. When it gets there, the solenoids are switched to hold that position.

The positioner circuit incorporates a unique power supply allowing it to be powered by any of 24V dc, 115V ac or 230V ac, 50/60 Hz, without the need for any change. The supply maintains full isolation of the low voltage control circuit from the power input line (up to 5KV). Switching of the solenoid valve outputs is achieved through opto-isolated solid state switches which operate at all the above voltages – only the solenoid coils themselves need to be adapted specifically to the supply voltage. The use of solid state switching avoids any limitations on relay contact life.

Double acting models are available as fail-free (standard), fail-down (moves clockwise or counter clockwise on loss of electrical power if air supply is still present) and fail-hold (holds position on loss of electrical and / or air supply) variants. Spring return models move in the direction of the spring on loss of electrical or air supply.

An optional angle retransmit (AR) circuit can be retrofitted by plugging it into the top of the positioner circuit and fixing with three screws. The AR circuit is a 2-wire loop-powered 4-20mA device, which reads the position of the positioner's feedback pot. It is fully functional whether or not the positioner circuit is powered. The feedback signal is electronically isolated (ie. floating) relative to the low voltage positioner circuit (which in turn is electrically isolated from the power supply and solenoid connections).

Extra solid-state switches have been incorporated on the positioner board to allow supply to both solenoid valves via a single cable for movement to the upscale position when the positioner is in spring-return or fail-down mode, while still allowing the positioner to control the two valves independently for the mid position. If the mid-position input is energised, then these extra switches isolate the solenoids from the upscale/downscale inputs.

The three power input lines (for up, mid, down positions) are independently fused using plug-in miniature fuses on the positioner circuit board.

External connections are made via a multi-option connector board, which allows simultaneous connection of up to four changeover limit switches, three control supply inputs plus neutral/negative, and a single low-voltage signal. This connector board, like the positioner circuit assembly, mounts in either the standard ULS or XLS box using two screws.

If an angle retransmit circuit is fitted using the low voltage signal terminal, optional 4-20mA inputs or external setpoint pot wires can be connected, either directly to the terminal block on the positioner circuit or, if only three or less limit switches are in use, relayed through an unused limit switch terminal on the connector board.

The limit switch box is fitted with a ground terminal which must be connected to a suitable external ground.

Industrial solenoid valves which permit the use of standard quality air supplies (instrument quality air is not necessary), are direct-mounted on adaptor blocks on the side of the actuator, and electrically connected via steel-armoured flying leads with DIN sockets on the solenoid end. At the positioner end, they connect to two 2-way terminal blocks on the circuit board. A range of solenoid valve options are available, determined by the function required, the supply voltage, and whether or not the unit requires hazardous area certification. Customer selection is via the order code.

- Robust modulating actuator control - tolerant of standard quality air supplies (instrument quality air is not necessary) via industrial solenoid valves.
- Three position rotary control using only three electrical inputs plus air supply, for filling applications etc.
- Two endstop positions + adjustable mid position anywhere in angular range of actuator (90 or 180°).
- Control circuit mounts inside standard all metal industrial quality Kinetrol ULS or XLS limit switch boxes – available fully assembled, or (on non-explosion proof models only) for user retrofit to existing boxes.
- Direct mounting onto model 05 to 15 actuators. Namur mounting options available.
- Uses direct-mounting standard solenoid valves outside box to position actuator.
- Easy adjustment of mid position set point by switch-selectable choice of methods: on-board pot, remote pot or 4-20mA input signal.
- Explosion proof options available (approved to IECEX, ATEX) by use of XLS housing plus standard explosion proof solenoid valves (see page 45).
- All new positioner circuit – runs on 24V dc, 115V ac or 230V ac power without any adjustment.
  - Solid-state universal-voltage solenoid switching -no mechanical contacts.
  - Three separate on-board mains fuses for three inputs.
  - Switchable selection of mid-point setting method (on-board preset, remote preset, remote 4-20mA signal).
  - Switchable selection of double acting or spring return operating mode.
  - Power input isolated from signal inputs and outputs for all voltage options.
  - Moulded reinforced plastic internal circuit cover for insulated safety.
  - Positioner has user-adjustable zero, span, deadband and damping parameters via preset pots for easy optimisation of positioning performance.
  - Damping parameter gives velocity-proportional setpoint advance to allow better stabilisation of fast-moving or high-inertia loads while maintaining resolution and repeatability.
- Retrofittable isolated loop-powered 4-20mA angle-retransmit circuit available – just plugs in inside same enclosure – with its own user-adjustable zero and span presets.

## Specification

<b>Compatible Actuator Sizes</b>	models 05 to 15
<b>Supply Voltages</b>	230V ac ± 10%, 50 or 60 Hz 115V ac ± 10%, 50 or 60 Hz 24V dc ± 10%
<b>Power Consumption</b>	positioner 1.5W max. solenoids 5 VA max. per solenoid.
<b>Operating Temperature Range</b>	-5 to +50°C (limited by solenoid valve specification) explosion proof option see page 45
<b>Operating Pressure</b>	30 to 100 psi 2.0 to 7.0 Bar
<b>Selectable External Inputs</b>	4-20mA - impedance 250 ohm. Potentiometer - minimum resistance 10K ohm.
<b>Positioner Performance</b>	linearity - better than 1% of range deadband - 0.1 to 3% of range repeatability - better than 1% of range
<b>Optional 2-wire Angle Transducer</b>	supply voltage - 14.7 to 27V dc. output - 4-20mA. linearly proportionate to angular position, electrically isolated from all other inputs and outputs functions with or without positioner circuit energisation
<b>Dimensions</b>	see page 64

## Ordering Codes

**SWITCH OPTIONS**  
(SUPPLIED WITH 2 DOGS AS STANDARD)

0 = NO SWITCHES  
1 = 2 x V3 PROXIMITY SENSORS  
4 = 2 x V3 SPDT SWITCHES  
5 = 2 x 20-250Vac, 10-300Vdc PROXIMITY SENSOR  
6 = 2 x 5-60Vdc PROXIMITY SENSOR  
7 = 4 x V3 SPDT SWITCHES  
9 = 2 x V3 SPDT GOLD PLATED CONTACTS  
A = 4 x V3 PROXIMITY SENSORS  
B = 4 x 20-250Vac, 10-300Vdc PROXIMITY SENSOR  
C = 4 x 5-60Vdc PROXIMITY SENSOR  
D = 4 x V3 SPDT GOLD PLATED CONTACTS  
E = 2 V3 20-140Vac, 10-140Vdc PROXIMITY SENSOR  
F = 4 V3 20-140Vac, 10-140Vdc PROXIMITY SENSOR  
M = 4 V3 10-30Vdc 3-WIRE PROXIMITY SENSOR  
N = 2 V3 10-30Vdc 3-WIRE PROXIMITY SENSOR

**DOUBLE ACTING / SPRING RETURN**  
2 = SR CW  
3 = SR CCW  
4 = DA CCW ON SIGNAL RISE  
7 = DA CW ON SIGNAL RISE

0 = WITHOUT ACT  
1 = WITH ACT

- = MALE  
F = FEMALE  
S = SERRATED

**DOUBLE ACTING FAIL MODE**  
H = FAIL-HOLD  
- = FAIL-FREE (STANDARD)  
D = FAIL-DOWN

1 = CLOSE / DIRECT MOUNT  
2 = DISCRETE MOUNT KINETROL 05 SQUARE  
3 = DISCRETE MOUNT NAMUR INTERFACE

FLOW REG / SILENCER OR AR  
0 = NO FRS OR AR  
1 = FRS  
2 = FRS + AR  
3 = AR

0 = STANDARD INDICATOR  
M = MONITOR  
C = CHEMICAL RESISTANT MONITOR

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ACTUATOR MODEL 05 - 15

SUPPLY VOLTAGE  
0 = 240V ac  
1 = 115V ac  
2 = 24V dc

APPROVAL TYPE  
0 = STANDARD BOX (ULS)

4 = ISO THREAD (M20)  
3 = DIN FLANGE (M20 - FEMALE DRIVE)  
7 = ANSI THREAD (1/2" NPT ON XLS, 1/2" NPS ON ULS)

For more information see KF-633

Actuator size 05 must be fitted with flow regulators