KINETROL®

USA CONDENSED CATALOG

ROTARY ACTUATORS

KINETROL

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Company Background

Kinetrol was established as a firm of control engineers in 1958. Initially, the company's activities were based on its damping expertise which led to the development of Kinetrol's rotary viscous dashpots for smooth motion control.

Kinetrol later invented and patented its vane-type rotary pneumatic actuator, recognizing the emerging need for quarter-turn valve and mechanism actuation. Over this time we have continuously developed and extended our actuator and associated control equipment range to meet the ever-changing market demand for increasingly sophisticated and accurate process control and monitoring equipment. This effort has been recognized worldwide.

Kinetrol, manufacturing over four sites in Farnham, England, operates on a worldwide basis. Working through our own subsidiaries and a network of independent distributors, we export at least 70% of sales to countries all over the world.

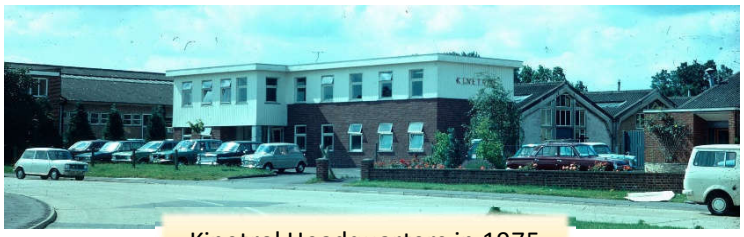
Kinetrol, with full inspection and test facilities, operates a rigorous quality control program which includes 100% functional testing of products and full serial number traceability. Our quality system is approved to ISO 9001.

Success comes from our determination for excellence.

Company Background

Past Facilities

Kinetrol Headquarters in 1958
Farnham, Surrey, England



Kinetrol Headquarters in 1975
Farnham, Surrey, England

Some of the Current Facilities

Kinetrol Headquarters Today - 66,736 ft²
Farnham, Surrey, England

Kinetrol 17A Facility - 23,681 ft²
Farnham, Surrey, England

Kinetrol Ashley House Facility - 11,840 ft²
Farnham, Surrey, England

Kinetrol Redfields Facility - 22,066 ft²
Farnham, Surrey, England

Kinetrol USA Facility - 14,126 ft²
Plano, Texas, USA

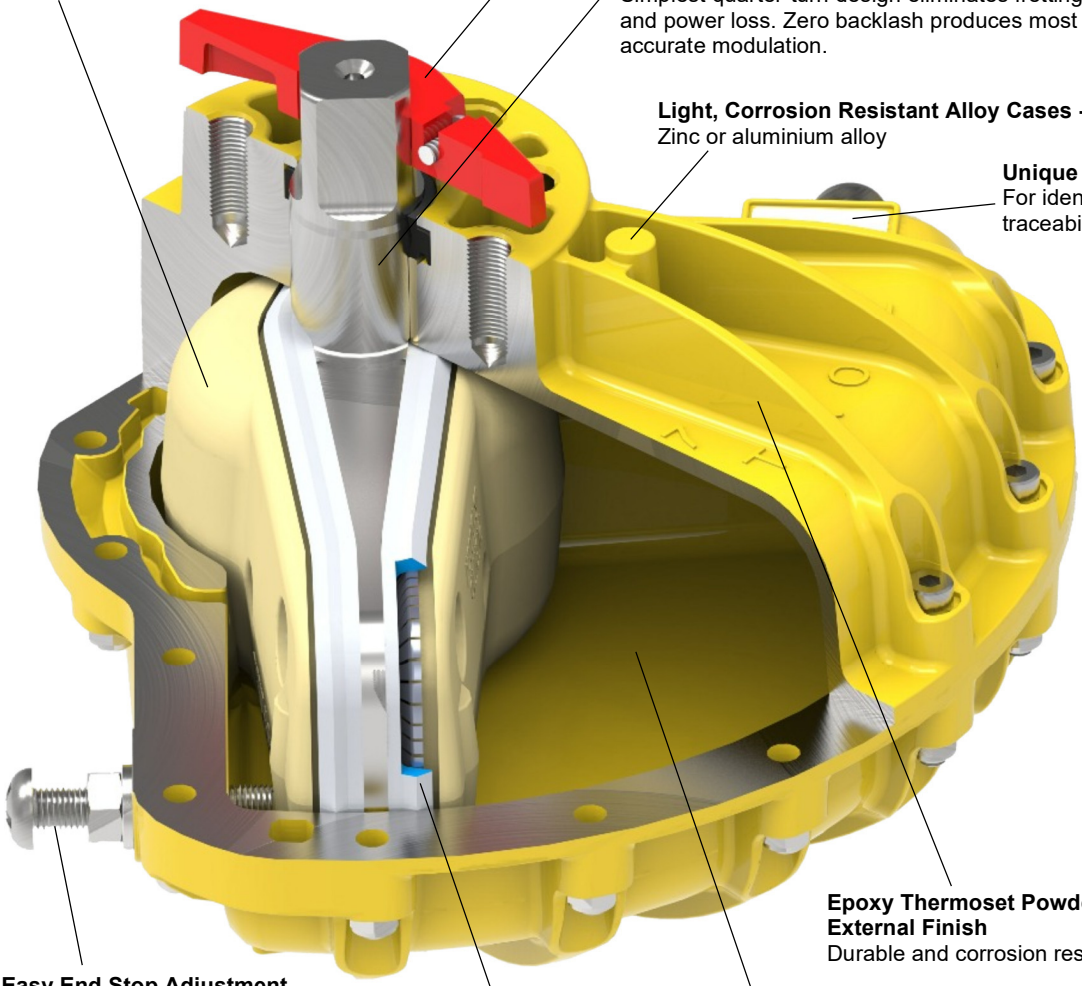
Kinetrol Vane Actuator Features

Applications

Operation or positioning of ball, butterfly, plug and control valves, ventilation dampers and automatic doors. Uses also include movement and positioning of components during manufacture - in fact anything that needs to be turned through 90° or less, automatically or by remote control.

LONG MAINTENANCE-FREE LIFE
Up to 4 million operations guaranteed

PROVEN IN SERVICE
Millions of units operating trouble-free worldwide



CHOICE OF MALE OR FEMALE OUTPUT DRIVE SQUARES
Easy and versatile interface to applications

CLOSE COUPLED CONTROL MODULES
Fail-safe spring returns, limit switch boxes, solenoid valves and positioners all close coupled to actuators

Kinetrol Spring Return Features

Spring housing cut away

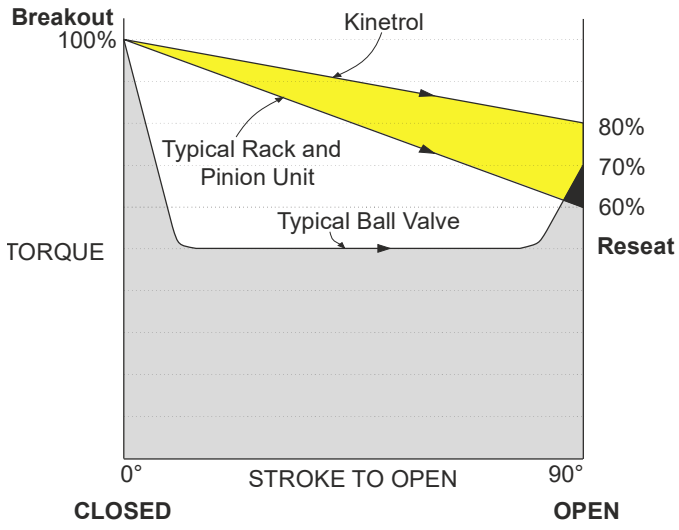
ATEX Up to Category 1

- **Lowest Torque Loss**
  Typically 20% through 90° yields extra torque through spring stroke - enables the selection of smaller actuators (see diagram)
- **Reliable low stress range clock type spring**
- **Separate housing for modular assembly, easily retrofitted**
- **Sealed, non-breathing housing**
  Protects spring in corrosive environments
- **Adjustable pretension for 'balanced' air and spring stroke torques**
  Various combinations available for balanced / optimised torques at various air pressures
- **Keeper plates available to ensure safe handling of pretensioned springs**
- **Available with ISO/DIN female drive and mounting for models 03-21**
- **Springs guaranteed against failure for lifetime of actuator**
- **ATEX Category 1 approved for many models**
  Category 2 for other models

The diagram shows the torque requirement of a typical ball valve under normal conditions. The typical torque output characteristics of Kinetrol and Rack and Pinion actuators, both sized to overcome the valve's breakout torque, are also illustrated. The diagram demonstrates that the Kinetrol actuator will exceed the torque requirement of the valve throughout the entire stroke whilst the rack and pinion unit will fail to reseat the valve.

The higher torque losses associated with the rack and pinion actuators (torque loss can be as high as 70%) dictate the selection of larger units to ensure complete reseating.

All spring units are guaranteed, in normal use, to operate correctly for as long as the original actuators to which they were fitted.



KINETROL SPRINGS
Lifetime Guarantee

Kinetrol Spring Units - Overview

Material Specification

Spring Casing	Models 02 & 03 pressure die-cast in ZL 16 zinc alloy. Models 05 to 60 in aluminium alloy.
Finish	Epoxy thermoset powder.
Spring	Clock type spring steel.
Square	Steel, zinc plated.
Mount Holes (output end)	Please see Single Acting Spring Return datasheet

Female Drive Spring Units

ATEX Up to Category 1

Features

- **Simple, elegant direct-mount interface**
- **Multiple ISO mounting flange hole drillings for each model**
- **Large ISO/DIN compatible ‘star’ drive for most models**
- **Valve leak tell-tale/relief slots in mounting face**
- **Female serrated insert drive options available for maximum direct mount flexibility on some models**
- **Keeper plates available to ensure safe handling**
- **Same reliable, long-life, fully sealed spring unit as on male-drive units**

Torques are identical to standard male-drive units.

Directions of spring action are as described above. Female drive spring units are always designed to be mounted between the actuator and the application. Consequently, a female spring designated ‘clockwise’ as a separate module will, when mounted below an actuator, result in a ‘clockwise’ assembly. Female drive springs are not designed to interface directly with modular switch boxes, positioners etc.

ISO/DIN ‘Star’ Drives

Female bi-square (star) drive spring fail-safe units are available for models 03 to 21.
Star drive units are specified by adding a ‘F’ to the DIN/ISO code: e.g. for a standard model 07 actuator with a female star drive, a regular 074-020 code becomes 073F020.

Serrated Drives

Female serrated drive spring fail-safe units are available for models 05, 07, 08, 09 & 10 to give maximum mounting flexibility.

Features include:

- Can accommodate large diameter valve stems
- Deep hole in shaft for long valve stems
- Precision stainless steel inserts
- Common internal drive shapes available
- Same spring can be used with different valve type/sizes
- 48 teeth allow many different orientations

Modular Add-On Control Units

Kinetrol modular concept easily provides the control assembly needed

(Please see separate data sheets for individual items)

1. Visual Indicator
Gives visual indication of valve position as standard except models 0M0, 01, 16, 18, 21, 30 and 60.

2. Clear Cone Monitor
Gives 360° and overhead position indication. Available on actuator models 03, 05, 07, 08, 09, 10, 12, 14, 15, limit switch boxes, AP positioners, EL positioners, P3 positioners and EHD models.

3. I/P Controller
4-20mA electrical signal controls main air supply to pneumatic positioner as alternative to air signal control.

4. AP Positioner
3-15psi (0.2-1 bar) air signal controls main air supply to turn, stop or hold the actuator vane in proportional response to that air signal. Limit switch and angle retransmit options available.

5. EL Electropneumatic Positioner
A single unit gives smooth accurate control in response to a 4-20mA signal. Limit switch and angle retransmit options in same housing.

6. DP3 Positioner
3 Position operation or 4-20mA modulation, fast, smooth, precise control and resilient to poorer quality air. Simple set up, quick calibration and loop powered angle retransmit as standard.

7. Explosion Proof P3 On/Off Positioner
Provides the same basic options as the P3 Positioner but in a flame proof enclosure with ATEX approval.

8. VLS/ULS Limit Switch Box
Weathertight unit with up to 4 switches for remote position indication or control use. Optional switches for flame proof/explosion proof needs and high visibility Clear Cone monitor.

9. Explosion Proof Limit Switch Box
Provides the same basic options as the VLS/ULS Switch Box but in a flame proof enclosure with ATEX, FM and IEC approvals.

10. Solenoid
Optional integral pneumatic solenoid valve for actuators. Various electrical, environmental and explosion proof requirements covered.

11. Actuator
18 sizes covering torque range 0.1 Nm (1 lbf in) to 40765 Nm (356,977 lbf in). Operating air pressure range 1.4 bar (20 psi) to 7 bar (100 psi). Adjustable stops as standard. Restricted travel stops and ISO/DIN versions available.

12. 180° Converter
Compact units give constant torque output through to 200° travel.

13. Fail-Safe Spring Return Units
Clock type spring return gives reliable fail-safe operation with high torque output throughout spring stroke, yet has easy adjustment to suit application.

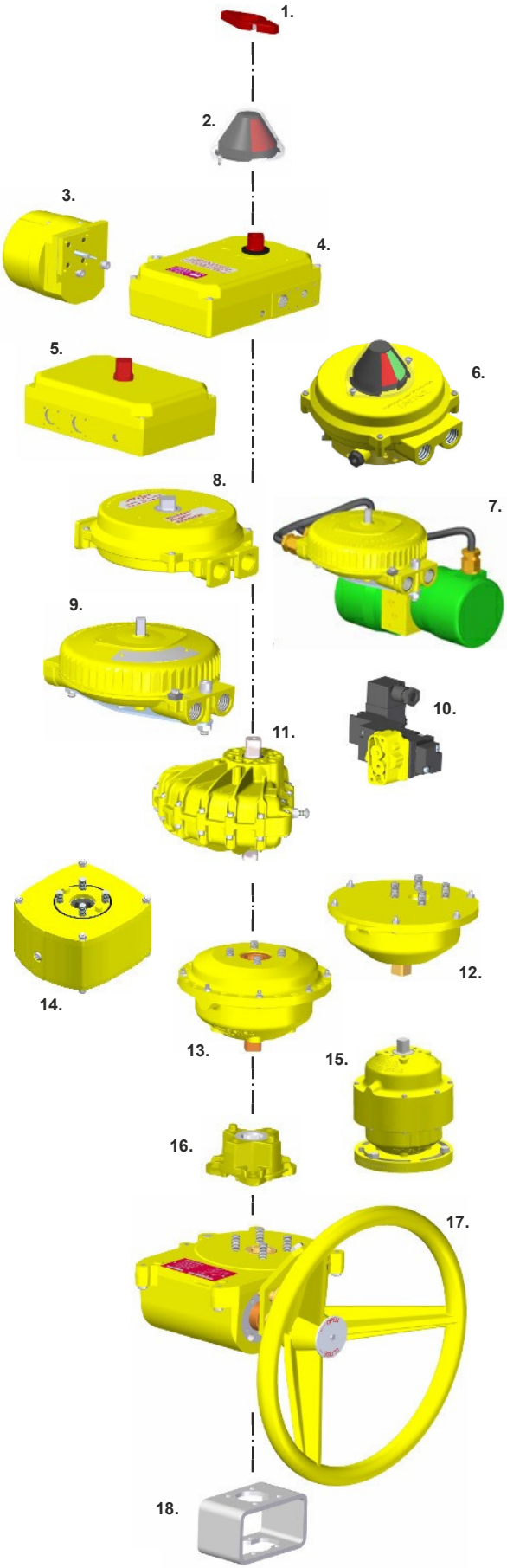
14. Modular Fail-Safe Spring Return Unit
Clock type spring return unit with the ability for the direction of the spring to be reversed with only simple tools and completed in minutes - Models 03, 05, 07 & 15 only.

15. Spring To Centre
Patented spring unit to provide accurate adjustable port travel position on loss of air/signal.

16. ISO Adaptor
The patented ISO adaptor provides easy conversion from a Kinetrol male drive to an ISO flange interface for ultimate mounting flexibility.

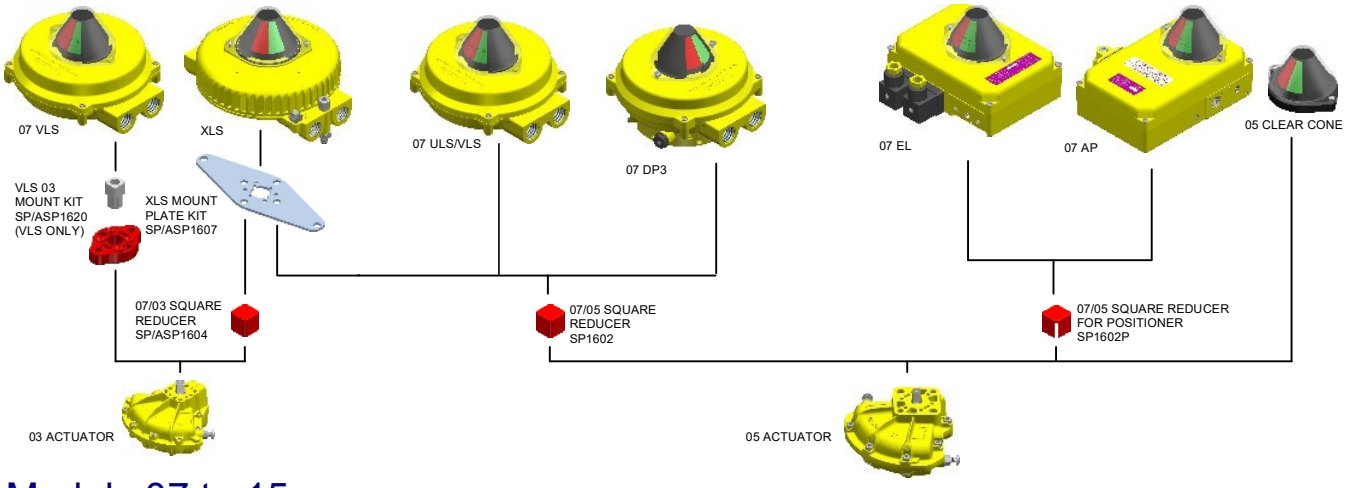
17. Gearbox
Geared manual override on all models from 05 to 21 excluding model 15.

18. Mounting Bracket
A comprehensive range of brackets provides for most ball, plug and butterfly valves.

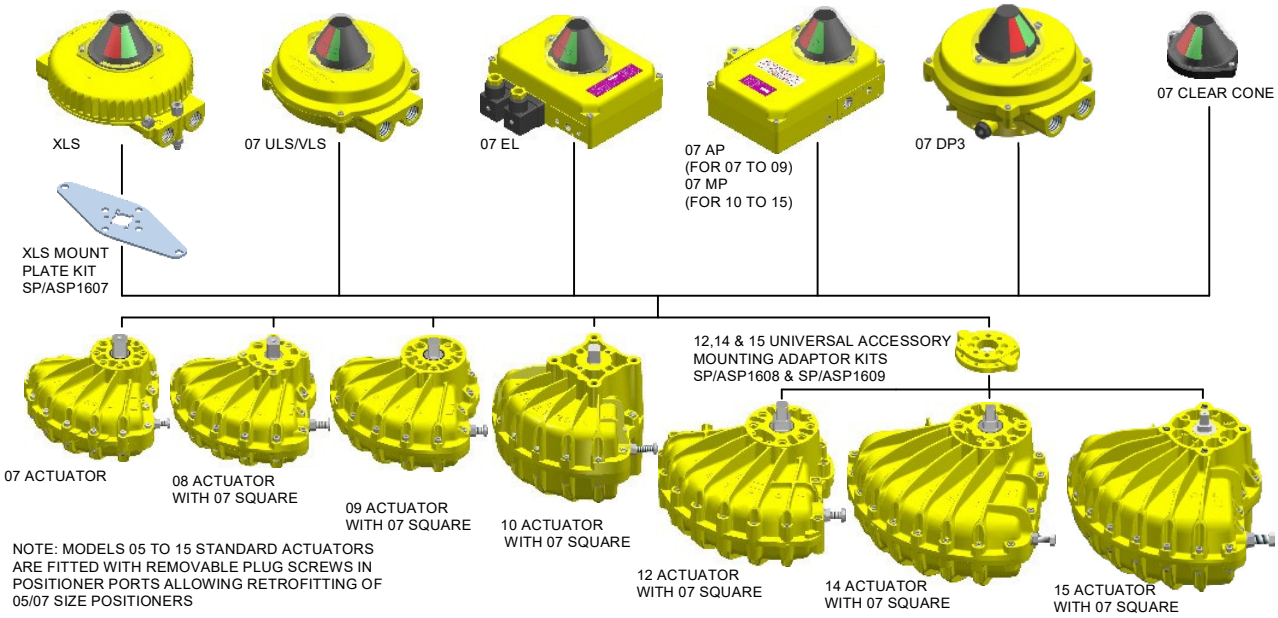


Kinetrol Control Units & Top-Mount Accessories

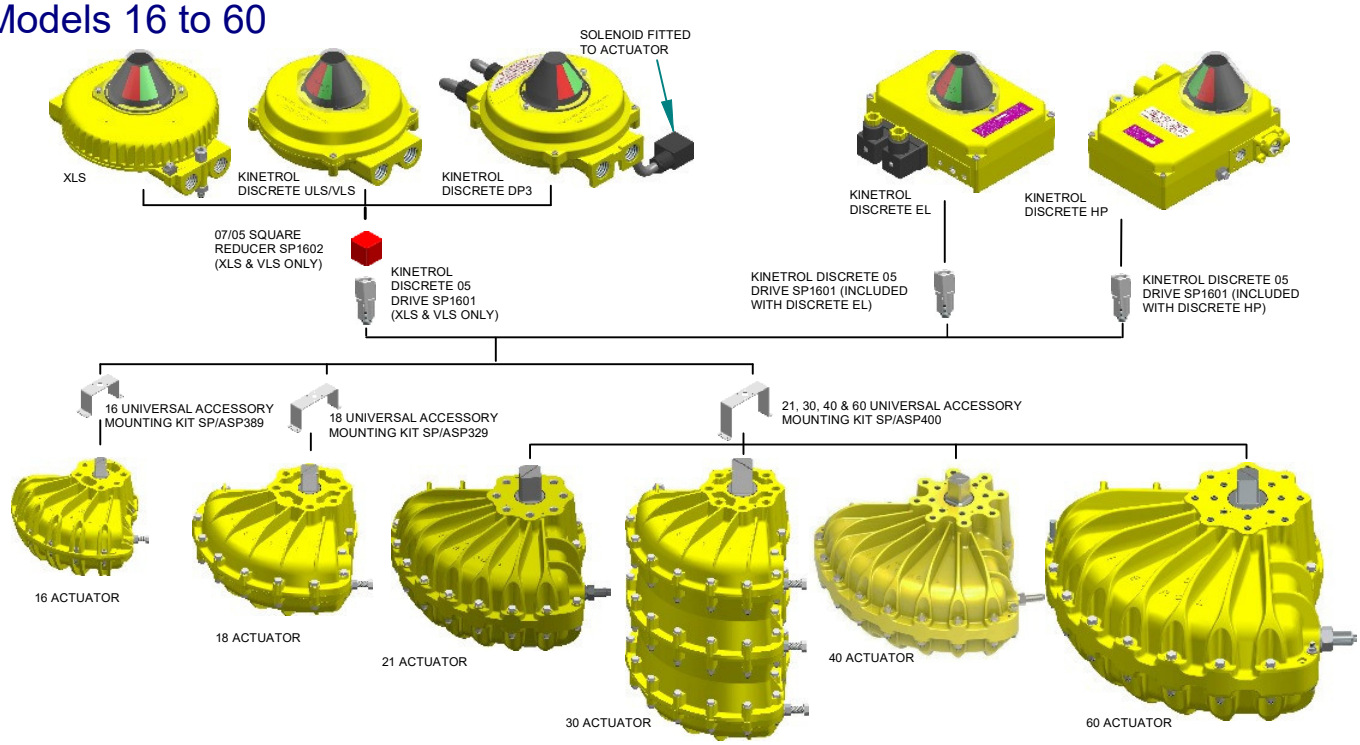
Models 03 & 05



Models 07 to 15



Models 16 to 60



Kinetrol AP Positioner

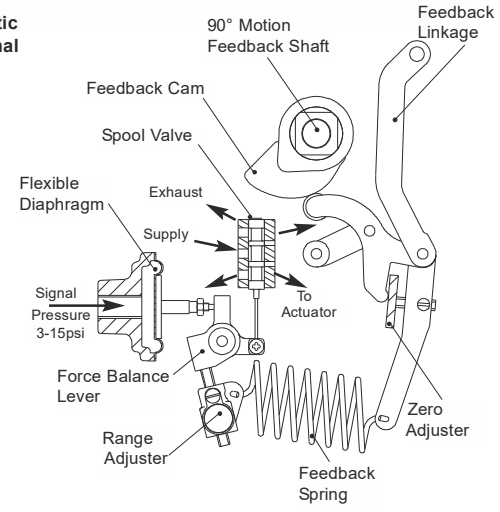
ATEX Up to Category 1

Operation

The AP Positioner is designed to drive a rotary or linear actuator to a position set by a 3-15 psi (0.2 to 1.0 bar) signal and hold it there until the signal changes. When a signal pressure is applied to the diaphragm it moves the force balance lever clockwise against the tension of the feedback spring. This moves the spool valve, supplying air pressure to one side of the actuator while exhausting trapped air from the other side. The feedback shaft follows the movement of the actuator and turns the cam counter clockwise, pushing the cam follower and increasing the tension on the feedback spring until it balances the forces on the diaphragm and moves the spool valve to its hold position.

The input signal and desired position is determined by the cam profile. A cam giving 0-90° output movement linearly proportional to a 3-15 psi (0.2-1.0 bar) signal is standard, and almost any desired characteristic can be supplied to order; if it cannot be found in the list of existing options contact Kinetrol.

Schematic Functional Diagram



The AP positioner moves an actuator to a position set by a 3-15psi control signal and holds it there. Its features are:

- **Fast, smooth, accurate response**
- **Simple, all-mechanical function for unbeatable reliability**
- **Three flow options to optimise control on all actuator sizes**
- **Universal application**
  The unit can be mounted in any orientation on to any quarter-turn or linear application
- **Easy set up**
  Quick calibration and reversal of rotational sense (clockwise and counter clockwise) without special tools or parts change
- **ATEX CAT 1 / IECEX approved versions available**
- **Easily retrofitted integral module options include:**

  Two wire 4-20mA angle retransmit (inside the same case)

  Mechanical or inductive limit switches (general or hazardous areas)

  4-20mA I/P convertors (general or hazardous areas)

  Clear Cone visual position indicator (general or hazardous areas)

  DIN plug option for retransmit connection

  Low (-40°C / -40°F) and high (100°C / 212°F) temperature versions available

  Fail hold options available

  Choice of mount options - see opposite
- **Weatherproof, compact and robust metal housing**
- **Vibration and shock resistant to 4G**
- **Built in ports for signal air supply and gauge connections**
- **ATEX CAT 2 Exd switch option available**

Kinetrol AP Positioner

The AP positioner can be directly mounted on standard Kinetrol models 05, 07, 08, 09, 10, 12, 14 and 15 actuators, both double acting and spring return, giving an assembly with no external plumbing, wiring or mechanical connections and the best in direct backlash free control. Mount kits are available for models 16, 18, 21, 30 and 60.
Alternatively, discrete versions mount on any actuator using VDI/VDE 3845 NAMUR drive, or Kinetrol male square with mounting brackets. Neat adaptations for linear cylinders are also available - consult Kinetrol for details.

Specification

Air Supply	instrument quality (dry, clean, oil free) 3.5 to 7 bar, (50 psi to 100 psi) standard. Consult Kinetrol for low pressure application
Signal	3-15psi (0.2-1.0 bar) standard. Consult Kinetrol for split range, 6-30 psi etc.
Control Response	0-90° linear output standard. Consult Kinetrol for other characteristic cam options
Sensitivity	better than 0.7% of span*
Hysteresis	better than 0.7% of span*
Deviation from linearity	less than 1% of span*
Flowrates @ 5.5 bar	AP: 3.3 scfm (93nl/min) MP: 10.0 scfm (283nl/min) HP: 27.0 scfm (764nl/min)
Operating Temperature Range	-20°C to +80°C (-4°F to +176°F) Standard -20°C to +100°C (-4°F to +212°F) High Temp -40°C to +80°C (-40°F to +176°F) Low Temp
Weight	2.8 kg / 6.2 lb
Materials	• case and cover - zinc alloy • spool and liner - stainless steel • diaphragm: - reinforced polyurethane (standard) - fluorocarbon rubber (high temp) - silicone rubber (low temp) • feedback spring - steel
Finish	epoxy thermoset powder
Enclosure Rating	IP54
Output Torque	same as double acting or spring return actuator. When controlling fast movement of inertia loads consult Kinetrol

* These refer to the combination of Kinetrol actuator with AP positioner - not just the positioner performance

Maximum Vibration Tolerance 4G, 100Hz

I/P Converter Options - please see I/P data sheet

Travel Times

Maximum velocity (no load) at 5.5 bar / 80 psi

Model	05	07	08	09	10	12	14	15
Deg/Sec	180	90	53	45	33	25	10.6	6.0

*Externally piped from AP positioner to actuator

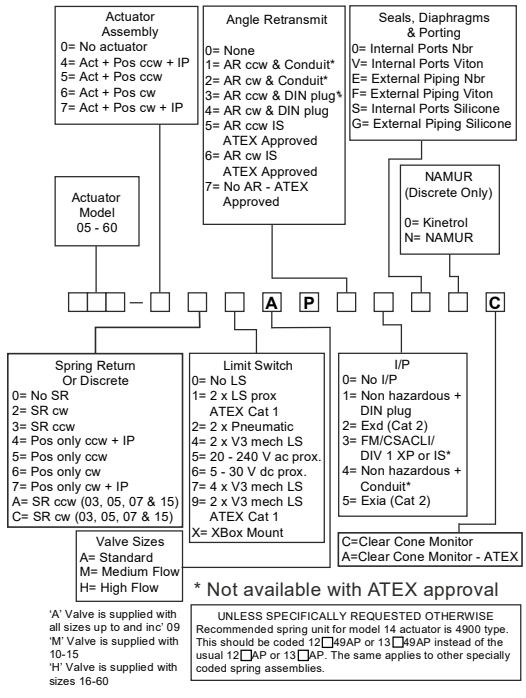
Model	12*	14*	15*	16*	18*	21*	30*	60*
Deg/Sec	32	13.8	7.5	22.5	11.3	5.9	3.8	1.9

Cam Options

Giving typical control characteristics. Contact Kinetrol for details of other options or see TD112.

Input Control: Air Signal	Electrical Signal	Output Movement	Characteristic	Cam No.
3-15 psi 0.2-1.0 bar	4-20mA	0-90°	Linear	5-1A
3-9psi 0.2-0.6 bar	4-12mA	0-90°	Linear	5-2A
6-12 psi 0.4-0.8 bar	8-16mA	0-90°	Linear	5-3A
9-15psi 0.6-1.0 bar	12-20mA	0-90°	Linear	5-4A
3-15 psi 0.2-1.0 bar	4-20mA	0-60°	Linear	5-5A
3-15 psi 0.2-1.0 bar	4-20mA	0-45°	Linear	5-6A
3-15 psi 0.2-1.0 bar	4-20mA	0-90°	Proportional Flow	5-7A
3-9 psi 0.2-0.6 bar	4-12mA	0-90°	Proportional Flow	5-8A
9-15 psi 0.6-1.0 bar	12-20mA	0-90°	Proportional Flow	5-22A
3-12 psi 0.2-0.8 bar	4-16mA	0-90°	Linear	5-13A
9-15 psi 0.6-1.0 bar	12-20mA	0-60°	Linear	5-14A

Ordering Codes



Kinetrol EL Electropneumatic Positioner

ATEX Up to Category 1

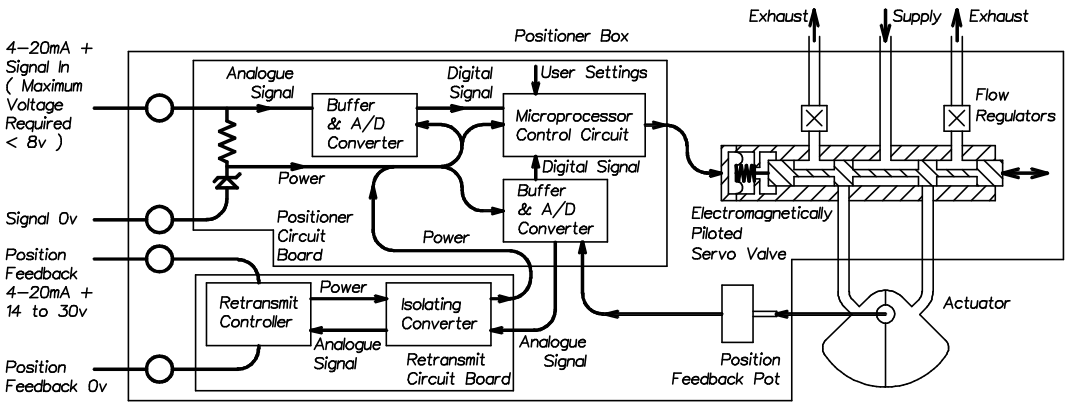
Operation

The EL positioner uses a unique low power proportional servo valve to control the position of a quarter-turn actuator.

The microprocessor in the loop-powered 4-20mA position circuit reads the signal via one channel of a 12-bit A-D converter, reads the position voltage from the feedback potentiometer via the second channel of the A-D converter, and compares the two. If it detects a position which is different from that required by the signal, it changes the output to the servo valve, in order to drive the actuator in the direction required to reach the correct position. As the actuator moves, the feedback potentiometer voltage changes and the microprocessor continually calculates the adjustments required for the servo valve in order to guide the actuator accurately into position. The microprocessor is programmed with a sophisticated but compact algorithm which allows this critical dynamic valve adjustment to be made correctly. This in turn gives optimal results with any actuator/load combination - slow or fast, low or high friction, low or high inertia. All can be optimised by tuning the PGAIN and DAMP parameters via the positioner circuit push buttons.

The EL positioner controls airflow to an actuator and moves it to a position determined by a 4-20mA signal. Its features are:

- **Fast, smooth and precise control from a digital circuit and proportional servo valve**
- **Simple time saving field set up**
  Quick calibration via push buttons and LED feedback and easy reversal of rotation sense (clockwise/counter clockwise) without special tools or parts change.
- **Universal application**
  The unit can be mounted in any orientation on to any quarter turn or linear application by connection via a NAMUR or Kinetrol square interface.
- **Loop powered**
  No separate power needed, just a 4-20mA signal plus air supply.
- **Integral options - easily retrofitted modules include:**
  - two wire 4-20mA isolated angle retransmit
  - mechanical or inductive position indicator switches (general or hazardous areas)
  - Clear Cone high visibility indicator
  - Threaded conduit entries or DIN plugs for external connection.
- **Intrinsically safe approved options**
- **Weatherproof, compact and robust metal housing**
- **Zero backlash coupling with easily adjustable switch strikers**
- **Vibration and shock resistant to 4G**
- **Built in gauge ports/external connections**



Simplified Functional Diagram of EL Positioner

Kinetrol EL Electropneumatic Positioner

Application

The EL positioner can be directly mounted on standard Kinetrol actuator models 05 to 15, both double acting and spring return, giving an assembly with no external piping, wiring or mechanical connections and the best backlash free control. Mount kits are available for models 16,18, 21, 30 and 60 actuators.

Alternatively, discrete versions mount on any actuator via VDI/VDE 3845 NAMUR drive, or Kinetrol male square, with mounting bracket. Special adaptations for linear cylinders are also available - consult Kinetrol for details.

The EL Positioner ATEX approval includes the fitting of a special version of the popular Clear Cone high visibility monitor.

Travel Times

Maximum velocity (no load) at 5.5 Bar / 80 psi
Direct mount from EL positioner to actuator

Model	05	07	08	09	10	12	14	15
Deg/Sec	129	65	38	33	22	15	6	4.3

*Externally piped from EL positioner to actuator

Model	7*	8*	9*	10*	12*	14*
Deg/Sec	76	46	38	28	18	8.6
Model	**15***	**16***	**18***	**21***	**30***	**60***
Deg/Sec	4.3	4.1	2	1	0.7	0.3

Specification

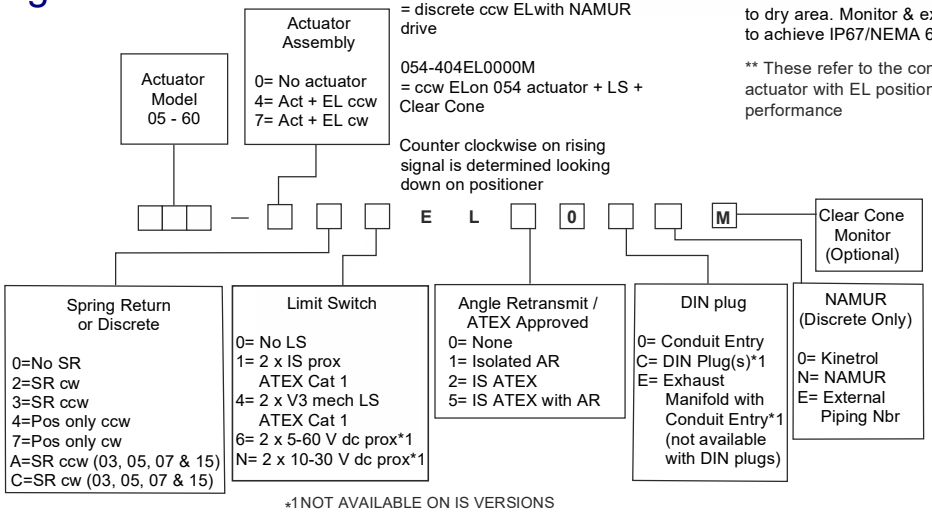
Air Supply	instrument quality (dry, clean, oil free Class 6.4.4 ISO 8573-1:2010), 3.5 to 7 bar (50 psi to 100 psi). Consult Kinetrol for 5µm inlet air filter option
Signal	4-20mA, requiring max 8V to drive through positioner circuit
Control Response	0-90° positioning with one linear and 10 non-linear preselected characteristics as standard. Consult Kinetrol for the following versions: i) linearisation of butterfly valve characteristics ii) Pre-selected travel time extension option (with active feedback control of travel speed) iii) customised responses
Sensitivity	better than 0.1mA**
Hysteresis	better than 0.7% of span**
Repeatability	better than 0.7% of span**
Deviation from Linearity	less than 0.7% of span**
Flowrate	3.3 scfm/93 l/m @ 5.5 bar
Operating Temperature	-20°C to +70°C (-4°F to +158°F)
Adjustments	low & high points (define range), proportional gain, velocity proportional setpoint advance (damping)
Weight	2.95 kg / 6.5 lb
Materials	case and cover - zinc alloy spool and liner - stainless steel
Finish	epoxy thermoset powder
Enclosure Rating	IP65/NEMA 4X IP67/NEMA 6 ***

Ordering Codes

Examples:
004-040EL000N
= discrete ccw ELwith NAMUR drive

054-404EL0000M
= ccw ELon 054 actuator + LS + Clear Cone

Counter clockwise on rising signal is determined looking down on positioner



*1 NOT AVAILABLE ON IS VERSIONS

*** With exhaust manifold fitted & exhaust ported to dry area. Monitor & exhaust manifold required to achieve IP67/NEMA 6

** These refer to the combination of Kinetrol actuator with EL positioner - not just the positioner performance

Kinetrol DP3 Positioner

The DP3 is a positioner that is capable of modulating with an external demand signal control (4-20mA or external potentiometer), 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 definable intermediate position without the need for any external demand signal control.

- Fast, smooth and precise control from a digital circuit
- Simple time saving field set up - quick calibration via push buttons and LED status indication
- 3 position operation or 4-20mA modulation
- Resilient to poorer quality air (class 4.5.5)
- Internally enclosed solenoid valves (Models 05—15)
  External solenoid valves (Models 16 - 60)
- Integral, loop powered, angle retransmit is isolated from both demand signal and power supply
- Spring return, double acting fail free, fail hold and fail down options available
- Signal, power and air fail hold options
- Speed control via integrated snubbers
  Fast to end stop and fast positioning options available
- Weatherproof, compact and robust metal housing

Operation

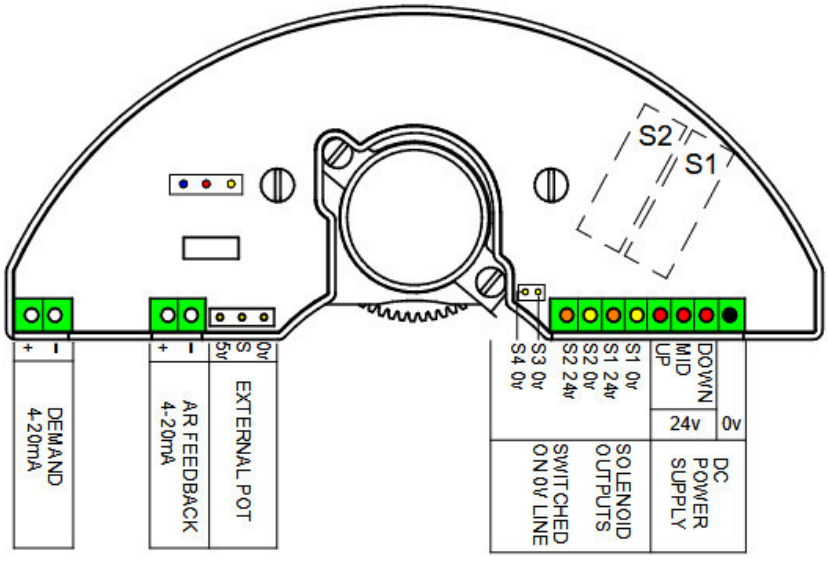
The all-new encapsulated digital circuit has a 3-button digital set up with 12 LEDs providing indication of unit status. It comes with quick set up and precision set up so that the unit can be calibrated to the level of accuracy required for the application. The new circuit offers 24V dc as standard, an additional PCB will allow 100V to 264V ac supply.

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”):

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

When using 4 - 20mA or potentiometer voltage, the “MID” terminal can be constantly energised, with the position being adjusted by altering the 4 - 20mA current or the potentiometer voltage.

Fast to end stop or fast positioning options are available which use additional solenoids to move faster whilst maintaining the positioning accuracy.

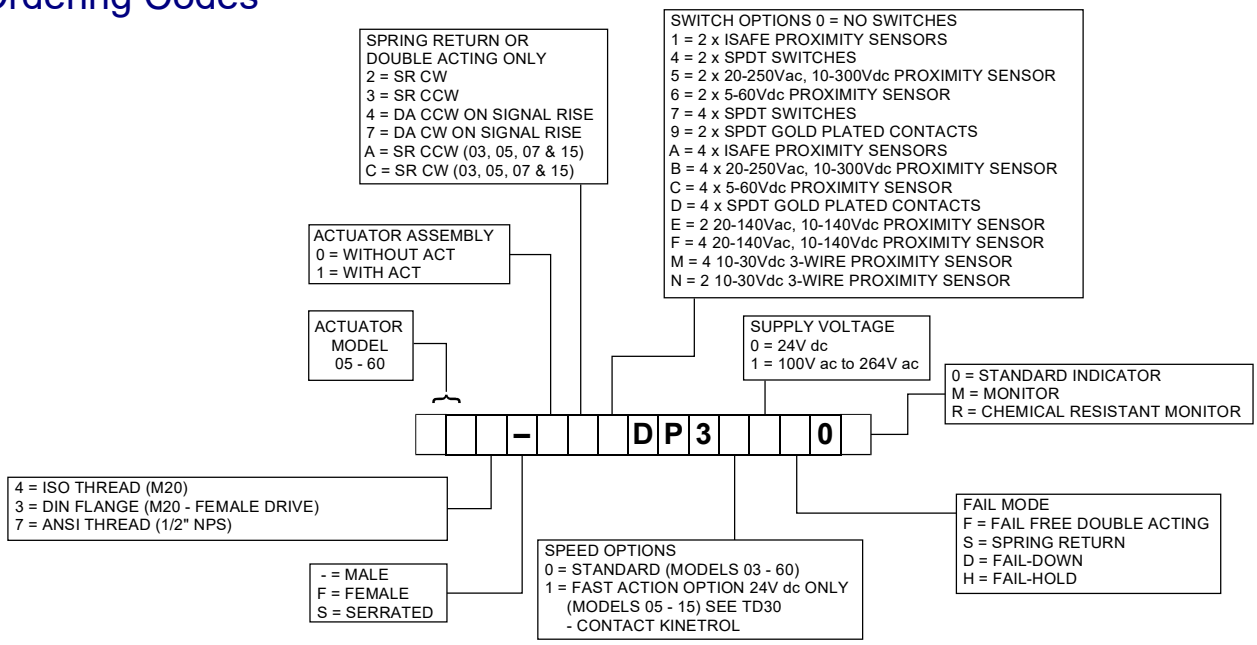


Specification

Actuator sizes	Models 05 to 60	
Supply Voltage	24V dc ± 10%	
Option:	100V ac to 264V ac, 50 / 60Hz	
Power Consumption	Positioner 1.5W max Solenoids 3VA max per solenoid	
Operating Temperature Range	-20°C to 70°C (-4°F to 158°F) For alternative temperature options contact Kinetrol	
Operating Pressure	3.5 to 7.0 bar (50 to 100 psi)	
Air Supply	Must be reasonably clean and dry and to quality class 4.5.5 (ISO 8573.1). This implies 25 micron max particle size, 7°C dew point maximum (or lower than ambient temperature below 7°C) and 25mg/cubic metre maximum oil content.	
Speed of Operation	Models 05 to 14:	5 seconds
(Unloaded - Factory Set)	Model 15:	10 seconds
	Model 16:	5 seconds
Speed is adjustable with snubbers depending on load	Model 18:	5 seconds
	Model 21:	5 seconds
	Model 30:	6 seconds
Model 16 - 60 using ½" solenoid	Model 60:	12 seconds
	Faster operating options are available - contact Kinetrol	

Current loop Input	4 - 20mA - impedance 250 ohm. Electrically isolated from all other inputs and outputs
Positioner Performance	Linearity - better than 1% or range
	Deadband - 0.1 to 3 % of range
	Repeatability - better than 1% of Range
Slave Valve Block Cv	1.6 (up to Model 15)
2 Wire Angle Retransmit	Supply voltage - 14.7 to 27V dc
	Output - 4 - 20 mA.
	Linearly proportionate to angular position, electrically isolated from all other inputs and outputs. Functions with or without positioner circuit energisation
Weight	1.7 kg / 3.75lb (Models 05 to 15)
Materials	Precision diecast aluminium alloy
Finish	Epoxy thermoset powder
Enclosure Rating	IP67 / NEMA 6

Ordering Codes



Kinetrol VLS Limit Switch Box

Offers a wide range of signalling options in a fully enclosed, corrosion resistant metal case. Available for direct mounting onto Kinetrol rotary actuators or discrete mounting via an industry standard VDI/VDE interface onto any make of rotary actuator. Easy to wire and set up with industrial standard robustness. Internally fitted options include AS Interface digital communication and a 4-20mA, 2-wire modulating angle retransmit circuit.

The range of switch and terminal arrangements includes 2 or 4 switches, extra connections allowing single point termination of wiring for limit switches and solenoid valves.
ATEX approved Ex d (Category 2) explosion proof and Ex ia intrinsically safe packages (Category 1). Integral sealed Clear Cone Monitor and red/green LED indicator options also give high visibility external visual indication of position.

Specification

Casing
Precision diecast aluminium alloy

Finish
Epoxy thermoset powder

Seals
Nitrile rubber ‘O’ ring seals

Cable entry options
2 or 4 entries

M20 x 1.5 Conduit thread
or
½ NPS Conduit thread

4 Way plug DIN 43650A
(fits either conduit thread)

4 Way M12 Connector
(M20 Conduit thread only)

ATEX Up to Category 1

Options

- Discrete VDI/VDE (NAMUR) interface option for use with any industry standard rotary actuators
- Units sealed to IP67/NEMA 6 (ATEX units IP66/NEMA 4X, IP67 option available)
- Robust corrosion resistant epoxy painted diecast box
- Easy and accurate setting of switch position
- Available for direct mounting to Kinetrol models 03 to 15 (for minimum height)
  Discrete Kinetrol 05 square drive insert for use with Kinetrol actuator models 16 to 60
- Quick access - No special tools required
- Two or four cable entries as standard to allow back wiring of solenoid valves
- Multiple switch options available for general and hazardous areas
- AS Interface bus circuit option inside box reads up to 4 switch inputs, drives up to 2 solenoids powered by bus only (see Kinetrol ASi Interface Bus Communication data sheet for more information)
- DeviceNet option inside box with various network speeds allows 2 on / off inputs and drives up to 2 solenoids (see Kinetrol DeviceNet Communications data sheet for more information)
- Optional Clear Cone monitor available
- Integral LED indicator lamps and angle retransmit circuit options are available

Kinetrol VLS Limit Switch Box

LOAD RATINGS FOR STANDARD MICROSWITCHES (type 004)

Voltage	Resistive Load
125 V AC	15A
250 V AC	15A
up to 12 V DC	15A
up to 24 V DC	10A
up to 48 V DC	3A
up to 250 V DC	0.25A

MULTIPLICATION FACTORS FOR NON-RESISTIVE LOADS

Steady state tungsten lamp load	- x 0.1
Steady state inductive load	- x 0.2
Peak inductive load	- x 1.0

Switch Options

Switch Type 001
2 intrinsically safe 2 wire inductive proximity sensors for hazardous areas (ATEX CAT 1), normally closed.
Ambient temperature range -20°C to +80°C (-4°F to +176°F)
ATEX Monitor must be fitted

Switch Type 002
2 pneumatic switches with 4mm (5.32") push in fittings (ATEX CAT 2), normally closed.
Ambient temperature range -15°C to +60°C (+5°F to +140°F)

Switch Type 003
Certificated unit to (ATEX CAT 2) Ex d e IIC T6 for hazardous area Zone 1. 2 x 3 wire switches for SPDT.
Ambient temperature range -20°C to +70°C (-4°F to +158°F)
ATEX Monitor must be fitted

Switch Type 004
2 x 3 wire microswitches for SPDT.
Ambient temperature range -40°C to +80°C (-40°F to +176°F)

Switch Type 005
2 x 2 wire proximity sensors 20-250 volts AC, 10-300 volts DC, normally open.
Ambient temperature range -25°C to +70°C (-13°F to +158°F)

Switch Type 006
2 x 2 wire proximity sensors 5-60 volts DC, normally open, with LED switch status indicators.
Ambient temperature range -20°C to +80°C (-4°F to +176°F)

Switch Type 007
4 x 3 wire microswitches for SPDT.
Ambient temperature range -40°C to +80°C (-40°F to +176°F)

Switch Type 008
2 x 2 wire inductive slotted proximity sensors, normally closed.
Ambient temperature range -20°C to +80°C (-4°F to +176°F)

Switch Type 009
2 x 3 wire gold plated contacts intrinsically safe microswitches for SPDT (ATEX CAT 1).
Ambient temperature range -20°C to +80°C (-4°F to +176°F)
ATEX Monitor must be fitted

For ATEX ratings please refer to TD139

Weight

VLS	–	0.68 kg / 1.50 lb

Temperature Range
Standard -20°C to +80°C (-4°F to +176°F)
High Temp Seals up to 100°C (212°F)
Also see switch temperatures

High Temperature Option
2 x V3 or 4 x V3 microswitch high temperature option suitable for 250°C / 482°F for a maximum of 2 hours exposure.
Available with both Kinetrol 07 drive or as Namur discrete.
Contact Kinetrol for special order codes and prices.

Switch Type 00A
4 intrinsically safe 2 wire inductive proximity sensors for hazardous areas (ATEX CAT 1), normally closed.
Ambient temperature range -20°C to +80°C (-4°F to +176°F)
ATEX Monitor must be fitted

Switch Type 00D
4 x 3 wire gold plated contacts intrinsically safe microswitches for SPDT (ATEX CAT 1).
Ambient temperature range -20°C to +80°C (-4°F to +176°F)
ATEX Monitor must be fitted

Switch Type 00E
2 x 2 wire proximity sensors 20-140 volts AC / 10-140 volts DC.
Ambient temperature range -25°C to +80°C (-13°F to +176°F)

Switch Type 00G
Certificated unit (ATEX CAT 2) Ex d e IIC T6 for hazardous area Zone 1, 4 x 3 wire switches for SPDT.
Ambient temperature range -20°C to +70°C (-4°F to +158°F)
ATEX Monitor must be fitted

Switch Type 00M
4 x 3 wire inductive proximity sensors 10-30 volts DC, normally open.
Ambient temperature range -25°C to +70°C (-13°F to +158°F)

Switch Type 00N
2 x 3 wire inductive proximity sensors 10-30 volts DC, normally open.
Ambient temperature range -25°C to +80°C (-13°F to +176°F)

Electronics Option B - E *
AS interface options are available with both the two and four entry Kinetrol VLS Limit Switch Box. Options B to E allow for different extended addressing options.

Electronics Option P *
Two or four way VLS Limit Switch Box fitted with potentiometer (20K ohms conductive plastic type).

Electronics Option R *
Two or four entry VLS Limit Switch Box fitted with angle retransmit, loop powered two wire circuit passes 4-20mA current, proportional to 0-90° position of actuator.

Electronics Option U (standard) *
Two or four entry VLS Limit Switch Box without AS interface card, angle retransmit or potentiometer.

* For more details on Electronics options see Kinetrol Asi Interface Bus Communication data sheet

Kinetrol Explosion Proof Limit Switch Box

The Explosion Proof Limit Switch Box offers a wide range of signalling options in a compact corrosion resistant aluminium alloy housing.
Available for close - mounting onto Kinetrol actuators or discrete mounting via a Kinetrol 05 square or industry standard VDI/VDE interface onto any make of rotary actuator. Easy to wire and set up with true industrial robustness.

Internally fitted options include AS interface digital communication and a 4-20mA, 2-wire, modulating angle retransmit circuit. The range of switches and terminal arrangements includes 2 or 4 switches and extra connections - allowing single point termination of wiring for limit switches and solenoid valves. This product is available to mount on Kinetrol models 03 - 60.

ATEX Category 2

Specification

Casing	precision diecast LM24 alloy, anodised & epoxy thermoset powder.
Coupling	zinc plated steel.
Seals	fluoropolymer dynamic seals and NBR static seals.
Weight	1.5 kg / 3.3 lb
Cable Entry Options	M20 x 1.5 or 1/2” 14 NPT conduit entry threads.

Options

- Discrete NAMUR drive for use with VDI/VDE 3845 rotary drive actuators
- Wide range of worldwide explosion proof approvals including IECEX, ATEX & FM (for USA & Canada) - all in one device
- All units protected to IP66 / NEMA 4X / TYPE 4X
- Attractive, functional and part-spherical profile. Robust corrosion resistant, anodised & epoxy painted diecast aluminium alloy housing
- Close - mount to Kinetrol actuator models 03 - 15 for low profile
- Discrete Kinetrol 05 square drive insert for use with Kinetrol actuator models 16 - 60
- 2 or 4 cable entries available to allow back wiring of solenoid valves
- Up to 4 switches available for SPDT, DPDT or multiple circuit operation
- Easy and accurate setting of switching position
- Optional antistatic Clear Cone Monitor available
- Integral angle retransmit circuit options are available
- Integral AS interface bus circuit option reads up to 4 switch inputs and drives up to 2 bus powered solenoids (see Kinetrol ASi Interface Bus Communication data sheet for more information)
- -40° C to +80° C (-40° F to +176° F) ambient operating temperatures (dependent on switch options)
- Positioner options available

Kinetrol Explosion Proof Limit Switch Box

Switch Options

Switch Type 001
2 intrinsically safe 2 wire inductive proximity sensors for 7.5-30V dc, normally closed.

Switch Type 004
2 x 3 wire microswitches for SPDT.

Switch Type 005
2 x 2 wire proximity sensors 20-250 volts AC, normally open.

Switch Type 006
2 x 2 wire proximity sensors 5-60 volts DC, normally open, with Led switch status indicators.

Switch Type 007
4 x 3 wire microswitches for SPDT.

Switch Type 009
2 x 3 wire gold plated contacts intrinsically safe microswitches for SPDT.

Switch Type 00A
4 intrinsically safe 2 wire inductive proximity sensors for 7.5-30V dc, normally closed.

Switch Type 00B
4 x 2 wire proximity sensors 20-250 volts AC, normally open.

Switch Type 00C
4 x 2 wire proximity sensors 5-60 volts DC, normally open, with Led switch status indicators.

Switch Type 00D
4 x 3 wire gold plated contacts intrinsically safe microswitches for SPDT.

Switch Type 00E
2 x 2 wire inductive proximity sensors 20-140 volts AC / 10-40V dc. (Not available on FM Approved Units).

Switch Type 00M
4 x 3 wire inductive proximity sensors 10-30 volts DC, normally open.

Switch Type 00N
2 x 3 wire inductive proximity sensors 10-30 volts DC, normally open.

Switching Operation Conditions

Switch Option	AC	DC	Current	Ambient Temperature Range (see Note 1)	
001/00A	–	8	6 mA	-20°C to +80°C	(-4°F to +176°F)
004/007	250	48	2.4A ac / 1.8 A dc	-40°C to +80°C	(-40°F to +176°F)
005/00B	250	300	100 mA	-25°C to +70°C	(-13°F to +158°F)
006/00C	–	60	100 mA	-20°C to +80°C	(-4°F to +176°F)
009/00D	–	30	100 mA	-40°C to +80°C	(-40°F to +176°F)
00E/00F	140	140	200 mA	-25°C to +80°C	(-13°F to +176°F)
00M/00N	–	30	100 mA	-25°C to +70°C	(-13°F to +158°F)

Note 1 - Dust environments are restricted to a minimum ambient temperature of -20°C (-4°F)

Approvals

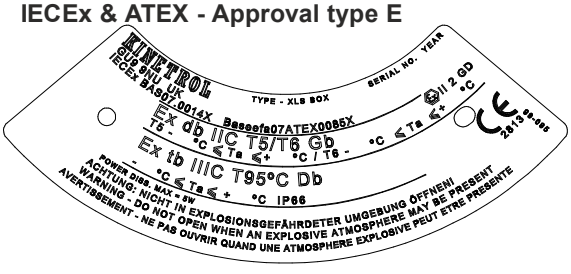
EUROPE/GLOBAL - ATEX / IECEx APPROVAL

Protection concept, Flame Proof 'd'	Group II C/A21, Category 2, Gas & Dust, T5, IP66

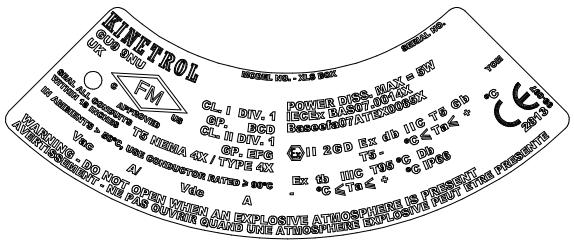
NORTH AMERICAN APPROVAL

Type of protection, Explosion Proof	US: Class I, Division 1, Gas groups B,C,D. Class II, Division 1, Dust groups E,F,G. T5 NEMA 4X. For Gas group A use order code "P". CANADA: Class I, Division 1, Gas groups B,C,D. Class II, Division 1, Dust groups E,F,G. T5 TYPE 4X.

IECEx & ATEX - Approval type E



FMC/U, IECEx & ATEX - Approval type F & P



Kinetrol’s stainless steel units use our proven quarter turn vane design in a CF3M casing.

Currently available: Models 05, 07 and 09.

Please contact Kinetrol for more information.

Kinetrol Stainless Steel VLS Limit Switch Box

Offers a wide range of signalling options in a fully enclosed, stainless steel case. Available for direct mounting onto Kinetrol rotary actuators or discrete mounting via an industry standard VDI/VDE interface onto any make of rotary actuator.

Easy to wire and set up with industrial standard robustness. Internally fitted options include AS Interface digital communication and a 4-20mA, 2-wire modulating angle retransmit circuit.

The range of switch and terminal arrangements includes 2 or 4 switches, extra connections allowing single point termination of wiring for limit switches and solenoid valves.

Specification

Casing
CF3M / 316L stainless steel

Finish
Shot blasted, acid pickled

Seals
Nitrile rubber ‘O’ ring seals

Cable entry options
4 entries

M20 x 1.5 Conduit thread
or
½ NPS Conduit thread

Options

- Discrete VDI/VDE (NAMUR) interface option for use with any industry standard rotary actuators
- Units sealed to IP67/NEMA 6
- Robust corrosion resistant stainless steel box
- Easy and accurate setting of switch position
- Available for direct mounting to Kinetrol 05, 07 and 09 stainless steel actuators
- Quick access - No special tools required
- Four cable entries as standard to allow back wiring of solenoid valves
- Multiple switch options available for general and hazardous areas
- AS Interface bus circuit option inside box reads up to 4 switch inputs, drives up to 2 solenoids powered by bus only (see Kinetrol ASi Interface Bus Communication data sheet for more information)
- DeviceNet option inside box with various network speeds allows 2 on / off inputs and drives up to 2 solenoids (see Kinetrol DeviceNet Communications data sheet for more information)
- Optional Clear Cone monitor available
- Integral LED indicator lamps and angle retransmit circuit options are available

Kinetrol Stainless Steel VLS Limit Switch Box

LOAD RATINGS FOR STANDARD MICROSWITCHES (type 004)

Voltage	Resistive Load
125 V AC	15A
250 V AC	15A
up to 12 V DC	15A
up to 24 V DC	10A
up to 48 V DC	3A
up to 250 V DC	0.25A

MULTIPLICATION FACTORS FOR NON-RESISTIVE LOADS

Steady state tungsten lamp load	- x 0.1
Steady state inductive load	- x 0.2
Peak inductive load	- x 1.0

Weight		
SS VLS	–	3.2 kg / 7.05 lb

Temperature Range

Standard -20°C to +80°C (-4°F to +176°F)
High Temp Seals up to 100°C (212°F)
Also see switch temperatures

Switch Options

Switch Type 002
2 pneumatic switches with 4mm (5.32”) push in fittings (ATEX CAT 2), normally closed.
Ambient temperature range -15°C to +60°C (+5°F to +140°F)

Switch Type 004
2 x 3 wire microswitches for SPDT.
Ambient temperature range -40°C to +80°C (-40°F to +176°F)

Switch Type 005
2 x 2 wire proximity sensors 20-250 volts AC, 10-300 volts DC, normally open.
Ambient temperature range -25°C to +70°C (-13°F to +158°F)

Switch Type 006
2 x 2 wire proximity sensors 5-60 volts DC, normally open, with LED switch status indicators.
Ambient temperature range -20°C to +80°C (-4°F to +176°F)

Switch Type 007
4 x 3 wire microswitches for SPDT.
Ambient temperature range -40°C to +80°C (-40°F to +176°F)

Switch Type 008
2 x 2 wire inductive slotted proximity sensors, normally closed.
Ambient temperature range -20°C to +80°C (-4°F to +176°F)

Switch Type 00E
2 x 2 wire proximity sensors 20-140 volts AC / 10-140 volts DC.
Ambient temperature range -25°C to +80°C (-13°F to +176°F)

Switch Type 00M
4 x 3 wire inductive proximity sensors 10-30 volts DC, normally open.
Ambient temperature range -25°C to +70°C (-13°F to +158°F)

Switch Type 00N
2 x 3 wire inductive proximity sensors 10-30 volts DC, normally open.
Ambient temperature range -25°C to +80°C (-13°F to +176°F)

Electronics Option B - E *
AS interface options are available with both the two and four entry Kinetrol VLS Limit Switch Box. Options B to E allow for different extended addressing options.

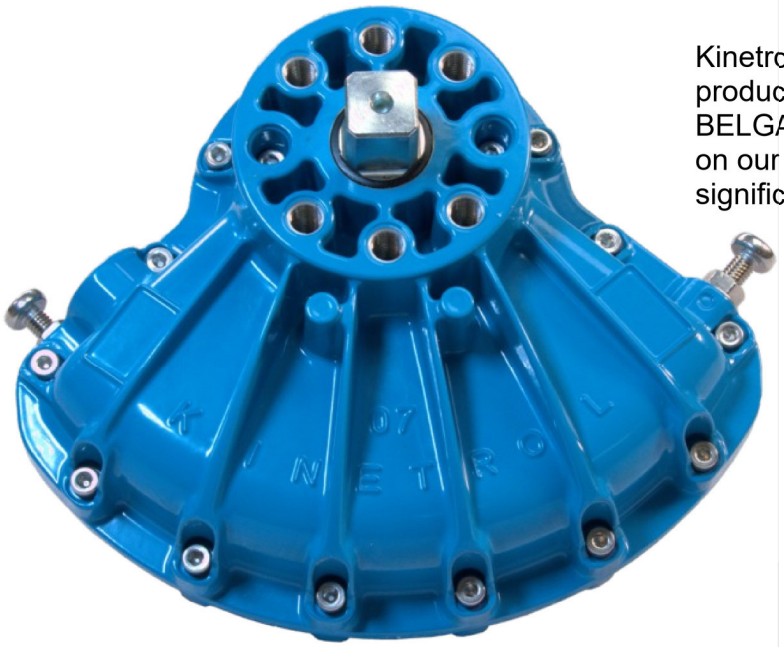
Electronics Option P *
Two or four way VLS Limit Switch Box fitted with potentiometer (20K ohms conductive plastic type).

Electronics Option R *
Two or four entry VLS Limit Switch Box fitted with angle retransmit, loop powered two wire circuit passes 4-20mA current, proportional to 0-90° position of actuator.

Electronics Option U (standard) *
Two or four entry VLS Limit Switch Box without AS interface card, angle retransmit or potentiometer.

* For more details on Electronics options see Kinetrol Asi Interface Bus Communication data sheet

Kinetrol Blueline Food Grade Finish Product



Kinetrol's Blueline coating solution for food production applications meets FDA and BELGAQUA specification and is available on our actuators and accessories offering significant advantages.

Specification

Paint Finish - Epoxy Powder RAL5015

Available option for:

Models 03 to 18 Double Acting and Spring Return

Positioners - EL and AP

Switch boxes - VLS / ULS and Explosion Proof

Features

- Good resistance to "caustic washdown"
- Exceptional resistance to chipping / flaking
- Good non-stick properties
- Good resistance to salt-laden environments
- In extreme circumstances if the coating becomes dislodged, it is clearly visible to the human eye, and sensors/detectors used in food production

KINETROL® BLUELINE

Please contact Kinetrol for more information

Kinetrol Manual Fail-Safe Spring Units

If you want to operate a valve manually, but maintain the advantage of the fail-safe spring's certainty of position when unattended, use this device.

- **Manual unit, cannot be left in the wrong position**
- **Reliable torque delivery for valve reseat**

ATEX Up to Category 2

- **ISO5211 female drive & ATEX Category 2 approved options available for models 02, 03, 05 and 07**
- **Clockwise or counter clockwise 90° spring action**
- **Spring housing sealed to IP65 to protect from internal corrosion**
- **Bi-square (star) and serrated female drive options available**

Application

Manual fail-safe spring units are available in Kinetrol sizes 02, 03, 05 and 07 with factory adjusted torques from 1.4Nm to 45.5Nm.

Direction of Spring Action

Manual fail safe spring units are available for either clockwise or counter clockwise spring action and the direction of the unit is determined by looking from above with the mounting interface on the bottom.

Suffix - 020 = clockwise
Suffix - 030 = counter clockwise

Ordering Codes

To order a manual fail-safe spring unit, quote model number, direction of spring followed by product type code:

Type Codes:	-1006	Manual spring unit (e.g. 054-020-1006)
	-1016	ATEX manual spring unit

For reduced torque versions contact Kinetrol.

Specification

Spring Case	
02, 03, 05 & 07 ATEX	Die cast zinc alloy, epoxy paint finish
07 non-ATEX	Die cast aluminium alloy, epoxy paint finish
Shaft	Stainless steel or carbon steel zinc plated
Manual lever	03, 05 & 07 - Stainless Steel 02 - Aluminium
Working Temperature range	-40°C to +80°C (-40°F to +176°F)

ISO/Female Drive Versions

The 03, 05 and 07 models are available with female drives for direct mount. The model 03 has F03/F05 or F04 mounting flanges, the model 05 has F03/F05/F07 or F04 flanges and the model 07 has a F05/F07 flange.

To order female drive versions, replace the '0-' in the product code with '3F'. For example a model 05 ISO female drive manual fail-safe cw handle with F03/F05/F07 flanges is coded: 053F020-1006. The F04 flange version is coded 053F020-1006/F4.

Female drive versions with the same flange dimensions are available with ANSI threads eg 057F020-1006/F4. Serrated female drive options can also be supplied for models 05 and 07. To order these replace the 'F' in the product code with an 'S'. Female 02 versions are available by use of an ISO adaptor, see ISO Adaptor data sheet.

Kinetrol Fire Fail-Safe Spring Units

To open or close a valve or damper automatically in case of a fire this device allows the valve to operate using a fusible link mechanism designed to yield at a set temperature.

ATEX Up to Category 2

- **Reliable torque delivery for valve reseat**
- **Available for Models 05, 07, 09 and 12**
- **Two Yield Temperature Options**
- **Clockwise or counter clockwise 90° spring action**
- **ISO5211 female drive options available**
- **Spring housing sealed to IP65 to protect from internal corrosion**
- **ATEX Category 2 approved options available**

Specification

Spring Case 05, 07, 09 & 12	Die cast aluminium alloy, epoxy paint finish
Output Shaft	Stainless steel or carbon steel zinc plated
Clock Type Spring	Stainless spring steel
Lever	Stainless Steel

Yield Temperatures

Fire fail-safe fusible links
Solder type (UL approved)

Yield temperature options	74°C	100°C
Max. normal ambient temperature	38°C	66°C

Direction of Spring Action

Manual fail safe spring units are available for either clockwise or counter clockwise spring action and the direction of the unit is determined by looking from above with the mounting interface on the bottom.

Suffix - 020 = clockwise
Suffix - 030 = counter clockwise

Ordering Codes

To order a fire fail-safe spring unit, quote model number, direction of spring followed by product type code:

-0074 Fire fail-safe spring unit 74°C
-0100 Fire fail-safe spring unit 100°C
-1074 ATEX fire fail-safe spring unit 74°C
-1100 ATEX fire fail-safe spring unit 100°C
(example: 054-020-0074)

For reduced torque versions contact Kinetrol

ISO/Female Drive Versions

The 05, 07, 09 and 12 models are available with female drives for direct mount. The model 05 has F03/F05/F07 or F04 mounting flanges. The model 07 has F05/F07 flanges, the model 09 has F07/F10 flanges and the model 12 has F10 flanges.

To order female drive versions, replace the '0-' in the product code with '3F'. For example a model 05 ISO female drive fire fail-safe unit with F03/F05/F07 flanges is coded: 053F020-0074. The F04 flange version is coded 053F020-0074/F4.

The same version but with ANSI threads is coded: 057F020-0074/F4.

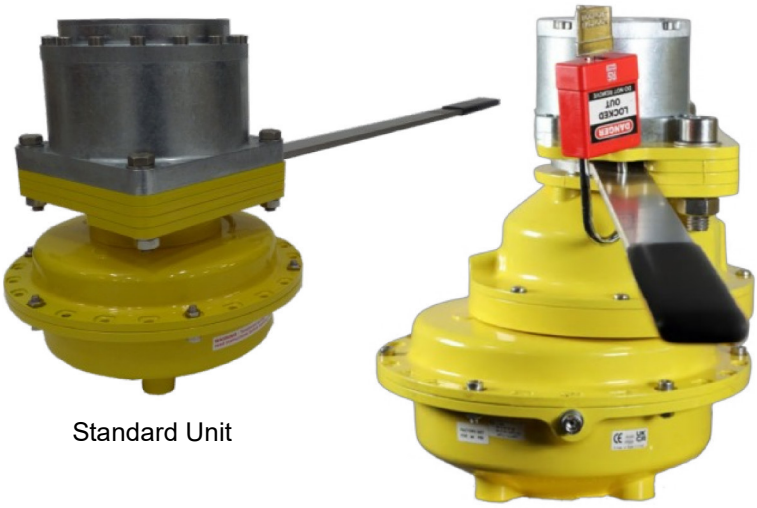
Kinetrol D-Line Lever Operated Damped Manual Fail-Safe

The D-Line range are specially developed damped manual fail-safe lever-operated units designed to safely operate valves manually whilst ensuring certainty of position when unattended.

Two options are available: our standard range and our torque multiplier range. The standard range is available as Models 07, 08 and 09, with either a 90° input to 90° output or a 180° input to 180° output. The torque multiplier range adds the Model 10 and comes with a shorter handle length, but is only available as 180° input to 90° output.

Both ranges have the following features:

- Manual unit, cannot be left in the wrong position
- Reliable torque delivery for valve reseat
- ATEX as standard
- All units sealed to IP65 to protect from internal corrosion
- Safe and easy manual lever operation using Kinetrol's energy dissipating rotary dashpot damping units
- Designed to meet valve standards: API 6D / S562 (JIP33) / BSEN13942
- Energy limited to 10 joules (adjustable as required)



Standard Unit

Torque Multiplier Unit

ATEX Up to Category 2

Standard Range

Application

The standard D-line lever operated damped manual fail-safe units use Kinetrol's highly reliable, low stress range, clock type spring linked with our dashpot to ensure the safe controlled return of the valve to its start position. The units are available as either 90° lever input with 90° spring action (clockwise or counter clockwise) or as 180° lever input with 180° spring action (clockwise or counter clockwise).

Specification

Materials of Construction
Spring case: Diecast aluminium alloy - epoxy thermoset powder coating
Clock type spring: Carbon spring steel
Energy-dissipating dashpots: Zinc alloy
Shafts: Stainless steel or zinc plated carbon steel
Locking plate: Mild steel - epoxy thermoset powder coating
Manual lever: Stainless steel

Operating Temperature
Standard: -40°C to 80°C (-40°F to 176°F)

Kinetrol VDI / VDE

Kinetrol's VDI/VDE 3845 mounting option is available from Model 03 up to Model 15. This option enables Kinetrol actuators to be retrofitted to assemblies where customers want to retain existing position feedback units.

Kinetrol actuator models 03 and 05 have an extended vane accessory shaft with a VDI/VDE 3845 Namur slot along with an adaptor plate that allows the fitment of an industry standard F05 VDI/VDE bracket.

Kinetrol actuator models 07 and 08 have standard length accessory shafts but incorporate the VDI/VDE 3845 Namur slot along with the adaptor plate.

Model 07 actuator with Namur slot and adaptor plate

Model 09 actuator with Namur slot and additional M5 mounting holes

Kinetrol actuator models 09 and 10 have standard length vane accessory shafts with the VDI/VDE 3845 Namur slot but also have additional M5 mounting holes machined into the case boss.

Kinetrol actuators model 12, 14 and 15 have a shortened vane accessory shaft with the VDI/VDE 3845 Namur slot, M5 mounting holes are standard supply on these actuators.

An industry standard F05 VDI/VDE bracket is also available but is not included as standard supply - please contact Kinetrol.

Ordering Codes

To order an actuator with the VDI/VDE mounting option add "V" to the end of the standard Kinetrol actuator code
Example: 054-100V or 074-120V

An industry standard F05 VDI/VDE bracket can be ordered in addition under spares code: SP642

Please contact Kinetrol for dimensional details.

Kinetrol Fast Acting Actuator Booster Blocks

Specially developed fast acting actuator booster valve blocks which deliver super fast operating times for larger actuators

- Available for Kinetrol Models 16 to 60 (1.7K to 40K Nm)
- Each block assembly acts as high CV 3/2 solenoid valve
- No external piping - direct mounts to actuator air ports
- Three block sizes with CVs from 30 to 180
- 90° travel time in 2 seconds at 80% load
- Standard 5/2 Namur solenoid valve, single or dual coil pilot each valve (ATEX and FM options available)
- Tested to over 1 million actuator cycles
- Both double acting actuators (two blocks) or single acting, spring return actuators (one block)
- Block A - SIL 2 capable. Blocks B & C, redundancy built in - SIL3

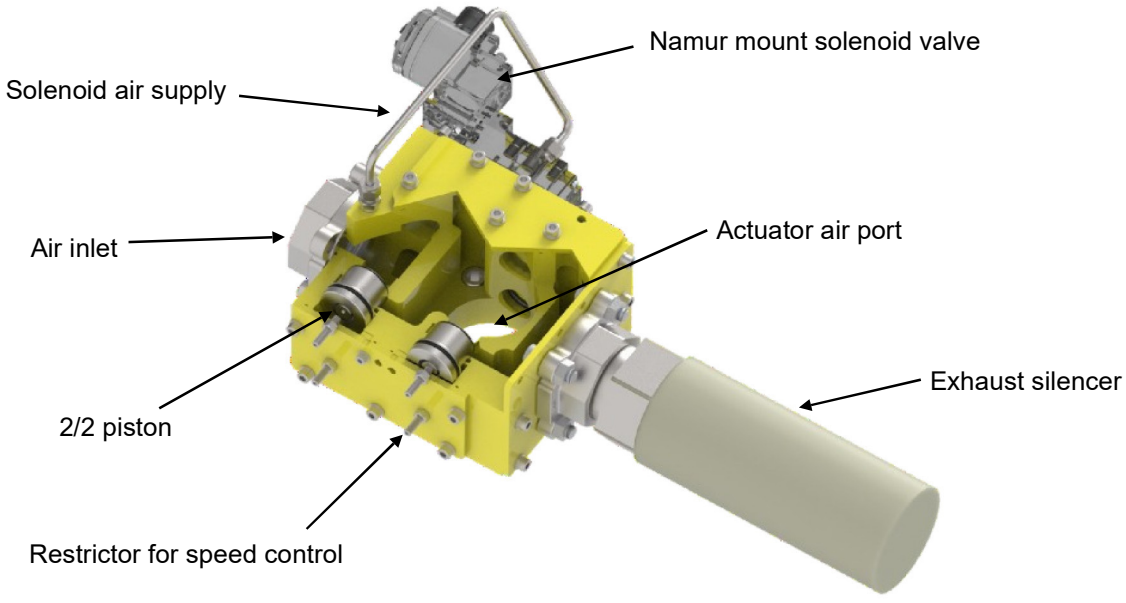
Model 21 fitted with two block ‘B’ variants

ATEX Up to Category 2

Application

Fast moving large actuators need high air flow. Current flow solutions available - booster valves or standard ball valves - are often unreliable in harsh environments and require expensive external piping. Kinetrol’s specially designed fast acting actuator booster blocks allow for super fast operation times combined with exceptional reliability (over 1 million actuator cycles) and durability.

The small-scale design of the blocks, coupled with the overall compact size of Kinetrol’s actuators, means the units can fit into limited access spaces, and costs associated with instrument panel mounting hard-ware & pipe work or added protection, such as fire proofing, are reduced. The low SIL failure rate numbers make this a unique option to consider when putting together Emergency Shutdown Valve packages.



Kinetrol Fast Acting Positioner Block

A specially developed fast acting positioner block for actuator Models 16 to 60 which allows for super fast modulating positioning without the loss of position accuracy.

- Improved travel times without the loss of positioning accuracy
- Direct mount to Kinetrol air top (if ordered with the actuator)
- Standard Kinetrol Model 07 AP & EL positioners mount directly to the fast acting positioner block
- Optional exhaust restrictors and pressure gauges available
- Retrofittable to standard Kinetrol actuators using external piping
- Can be used with other manufacturers' positioners (Contact Kinetrol)

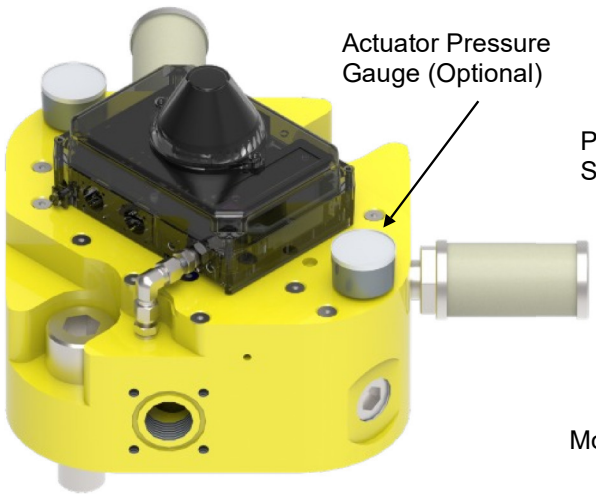
Application

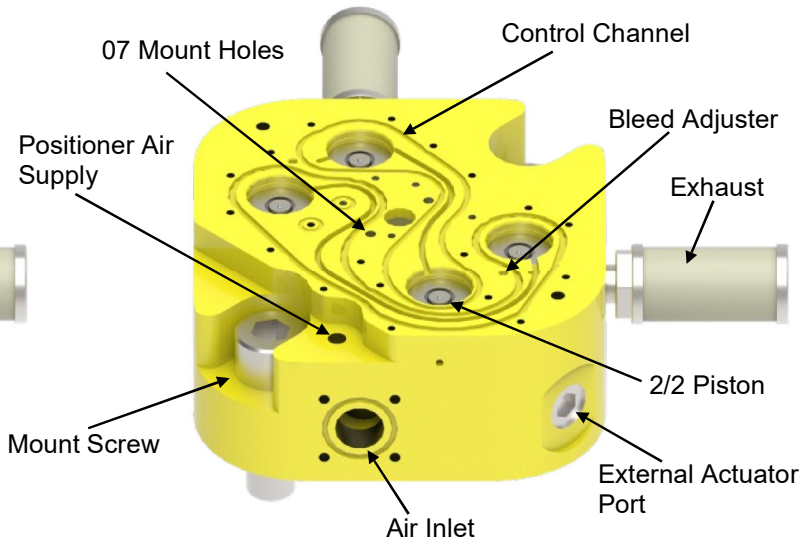
Kinetrol's new fast acting positioner block mounts directly on the accessory end of Model 16 to 60 actuators. The block, requiring special actuator air top holes, allows for the mounting of standard Kinetrol 07 drive AP and EL without the need for external piping, therefore reducing failure points.

Kinetrol's unique air piston technology delivers high volumes or air, greatly reducing operating time while sacrificing nothing in control accuracy. The accuracy and travel times achievable through the fast acting positioner block makes it an excellent solution for Safety Instrumented System (SIS) functions.

Non Kinetrol positioners can be mounted to the fast acting positioner block using a VDI/VDE 3845 mounting kit, again these will have to be externally piped.

Kinetrol's Model 60 spring return, with the spring mounted above the actuator, will need the fast acting positioner externally piped. In addition, retrofitted fast acting positioner blocks on actuator Models 16 to 60, without special air top positioner holes, will also need to be externally piped.





Kinetrol 180 Degree Pneumatic Actuators

ATEX Category 2

Features

- **Simple compact unit**
  No external moving parts
- **Unique linkage design**
  converts to 180° travel
  120° option available
- **Constant gear-up ratio through travel range**
  Hence constant output torque
- **Rolling contact linkage mechanism**
  Ensures low wear, long life, low friction
- **Linkage sealed for life**
  Protected from the environment, long maintenance free life
- **Compatible with all Kinetrol modules**
  Direct mounted spring returns, limit switch boxes, positioners etc.
- **Adjustable endstops**
  Giving up to 200° of travel

Operation

Kinetrol's 180° actuator is produced by adding a 2:1 step-up linkage onto the output shaft of well proven 90° vane actuators.

Factory fitted, direct mount linkage units are available to suit model 02, 03, 05, 07, 09, 12, 14 and 16 actuators, giving a neat single unit with no mount kits or brackets. The linkage's unique geometry gives constant 2:1 step-up so that the output torque remains constant throughout the actuator's travel.

The all-steel mechanism of the linkage employs rolling contacts to minimise frictional losses and wear, and to maximise life. The linkage is lubricated for life, and encased in a robust, fully sealed, die cast alloy casing. Exterior surfaces are protected by a corrosion resistant epoxy thermoset powder finish. Standard adjustable endstops on the 90 degree actuator can be used to set the angle of travel. The other end of the 90 degree actuator allows the full range of Kinetrol modular accessories to be fitted directly.

120 degree actuators are also available with adjustable end stops to give up to 133° of travel for the above model range - contact Kinetrol for details.

Ordering Codes

To order a 180° actuator, add a '1' to the end of the code for the 90° actuator on which it is based and a '2' for a 120° actuator.

Examples:
To order an 074 cw spring return actuator plus 180° linkage, use code: 074-1201.
To order an 074 cw spring return actuator plus 120° linkage, use code: 074-1202.

Kinetrol Spring to Centre Actuators

A patented part-turn rotary actuator that is driven to an end stop, in either direction, from an initial centre position and is spring returned to an accurate and positive mid point when the air supply is removed. The mid-position can be set mechanically anywhere in the actuator's travel range.

The spring to centre assemblies consist of one double acting actuator fitted with two or more opposing clock type springs contained within a single housing. Controlled with a dual coil, 5/3 solenoid valve (or two 3/2 single coil valves) which, when totally de-energised, allow the springs to precisely centre the actuator against physical stops. When either coil is energised the actuator will travel towards one of its end stops. As the vane moves towards an end stop the air stroke torque reduces as the spring torque increases and vice versa. When the coil is de-energised the vane will spring return to its original centre position. The usual 'centre' position will be in the middle of the actuator's 0 - 90 degree travel, but this can easily be adjusted to any mid-stroke location. A vernier scale on the adjustable plate (see attached picture) permits precise mid-position setting to within 1 degree.

(Actuator should be mounted to application to enable adjustable centre position and stationary end points)

ATEX Category 2

- Reliable low stress clock type springs.
- Sealed, non-breathing housing protects spring in corrosive environments.
- Available in models 05 to 18 (excluding 15).
- Stroke up to 100° (200° option available - contact Kinetrol)
- Mid position can be set mechanically anywhere in the actuator's travel range using 'vernier' type scale.
- Self contained spring assembly which can be easily removed without a keeper plate.
- Can be used in aggressive or hazardous environments without the need for complex or sensitive instruments.
- Can be fitted with high temperature seal option for up to 100°C

Specification

Casing: Pressure die cast aluminium alloy

Vane & Output Shaft: SG iron, zinc plated

Shaft bushes: PTFE coated bronze (lead free)

Seals: Moulded polyurethane

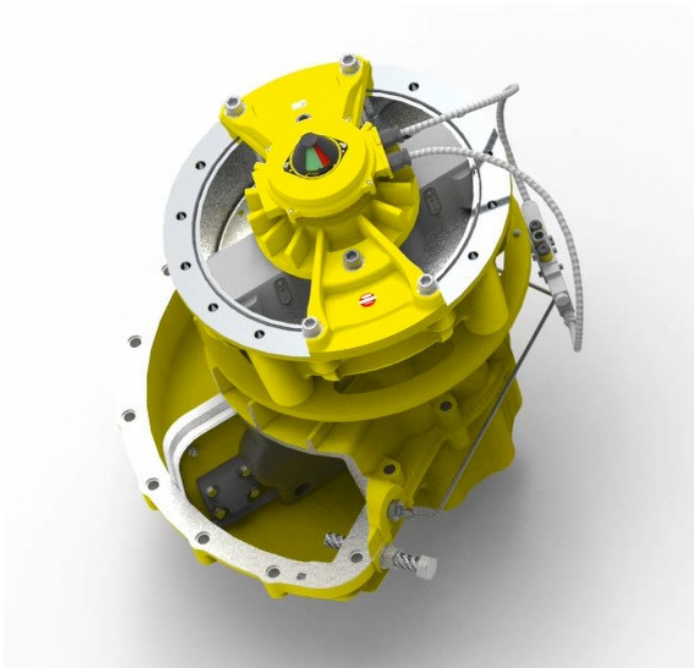
Seal expanders: Stainless spring steel

Clock Type Spring: Carbon spring steel

Finish: Epoxy thermoset powder

Operating Temperature
-40°C to +80°C (-40°F to +176°F)

Kinetrol Steadyline



Kinetrol's Steadyline pneumatic actuator assemblies are precision valve actuators, integrating our dashpot rotary damping units to provide smooth resistance to actuator/valve shaft rotation, and are designed to the customers individual requirements.

Kinetrol Steadyline assemblies smooth out the actuator's standard travel, dampen any flow-induced valve disc oscillations and allow the user to specify a minimum amount of travel time upon power failure.

KINETROL
STEADYLINE

Please contact Kinetrol for more information.

Kinetrol PDK Valve

Three-piece severe duty ball valves

Specification

Class 900 (148.9 Bar Max)

Floating Ball - Reduced Bore

O-ring loaded UHMWPE Seats

Tested at 100bar – 1M cycles

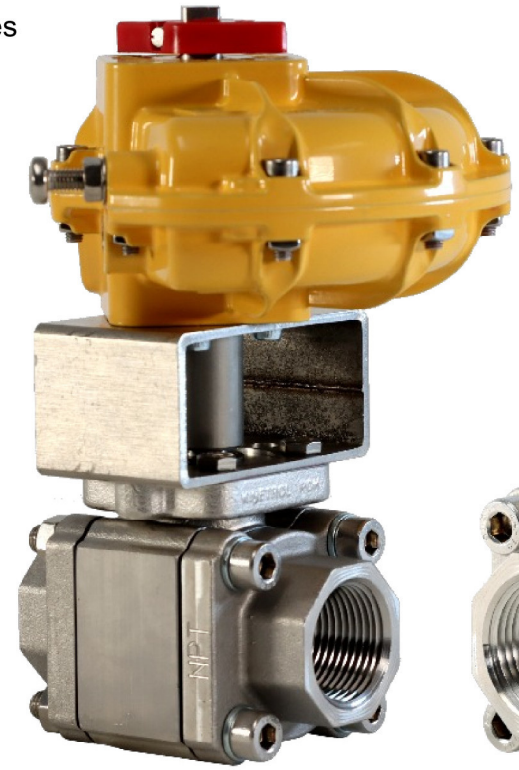
ISO5211 Mounting Pad

Operating Limits -40°C to 80°C
(-40°F to 176°F)

PED Category I Module A
Group 2 : Liquids & Gases

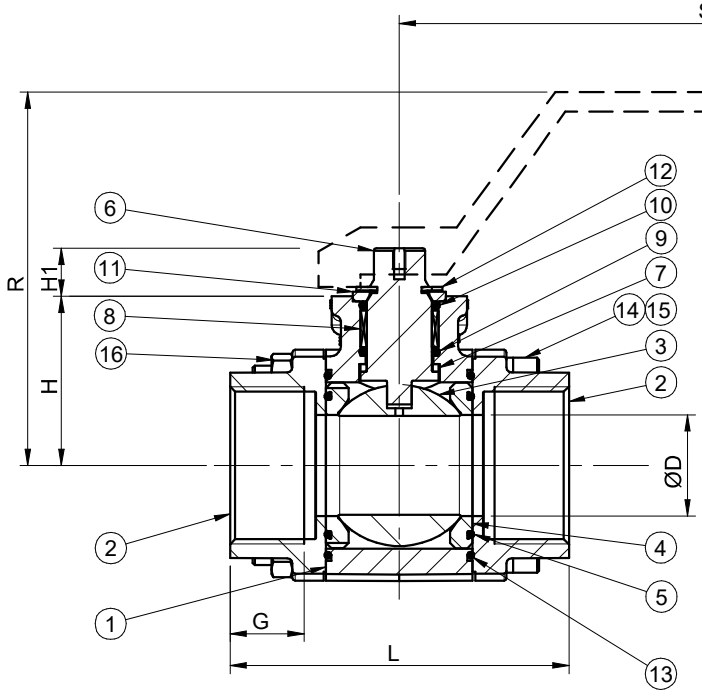
Designed to EN12516-1

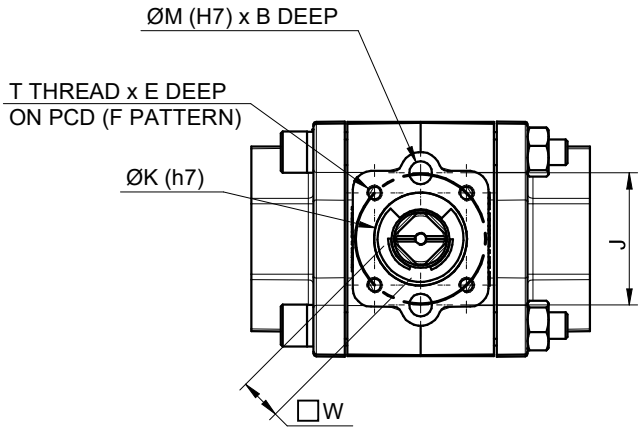
Tested to EN1226-1



ATEX Category 2

Dimensions & Materials List





DN	NPS	W	K	ØM	B	F	N	T	E
25	1	9.5	36	8.8	4	F05	4	M6	10
50	2	16.0	36	8.8	4	F05	4	M6	10

DN	D	G	L	R	S	H	H1	J	PCD	Cv	Torque (Nm)*	Weight (kg)
25	20.0	22	96	64	175	42.5	15.0	50.8	50	27	10	1.8
50	37.1	29	130	144	240	65.0	18.5	50.8	50	96	45	4.4

* does not include safety factor

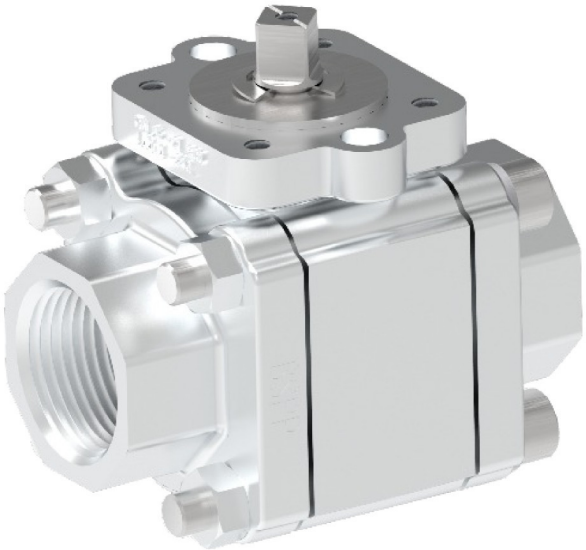
Kinetrol PDK Valve

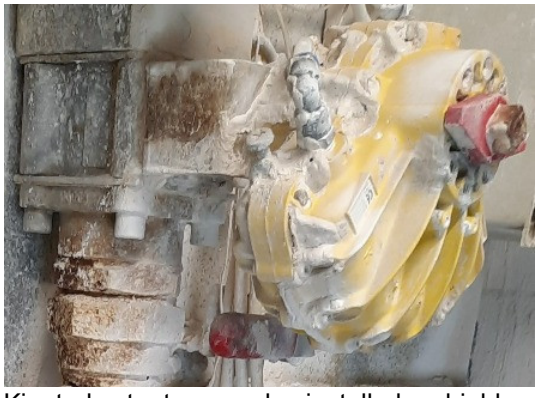
No.	Part Name	Material
1	Body	CF3M
2	End Cap	CF3M
3	Ball	CF3M
4	Ball Seat	UHMWPE
5	Seat O-ring	Nitrile
6	Stem	17-4PH / 316SS
7	Thrust Washer	UHMWPE
8	Stem Bearing	UHMWPE

No.	Part Name	Material
9	Stem O-ring	Nitrile
10	Bush O-ring	Nitrile
11	Stem Washer	316
12	Circlip	Plated Carbon Steel
13	Body O-ring	Nitrile
14	Bolt	A4-70
15	Washer	A4-70
16	Nut	A4-70

Features & Benefits

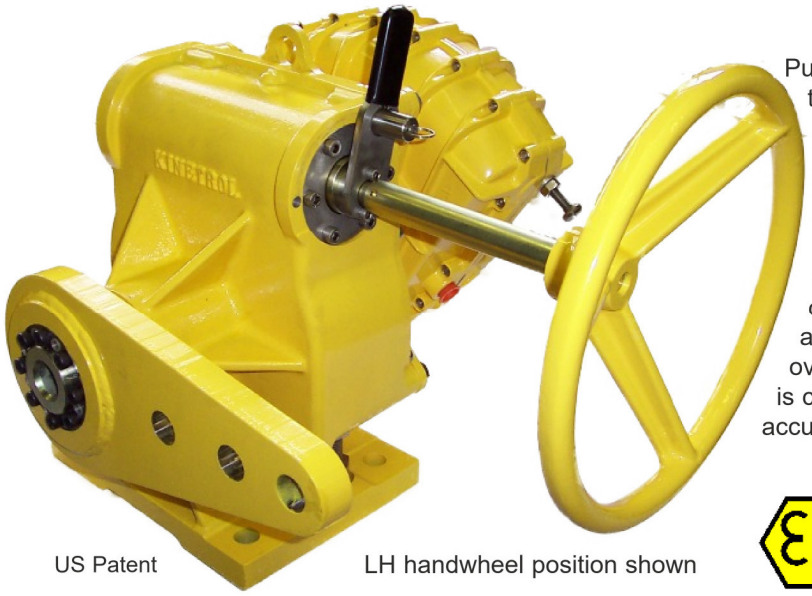
UHMWPE Seats	Ultra High Molecular Weight Polyethylene (UHMWPE) is extremely wear-resistant compared to PTFE. The valve seats last much longer than standard PTFE valve seats under the same conditions
O-ring Loaded Seat	Upstream and downstream, the valve seat continues to be pre-loaded onto the ball as it wears, ensuring the valve retains shut off tightness so media cannot leak past the seat
UHMWPE Stem Bearing	Stem alignment does not deteriorate over the life of the valve
2 off Stem O-rings	Stem leakage and foreign particle ingress is prevented by two stem o-ring seals. External leakage is prevented without the requirement to continually tighten a gland nut. In addition, the bearing surfaces are protected from particle ingress
Dowels in Valve Mounting Flange	Ensures good alignment between the valve and actuator, preventing premature failure from misalignment loading





Kinetrol actuator on valve installed on highly abrasive kaolin slurry feed pipes.

Kinetrol G3 Damper Drives



US Patent

LH handwheel position shown

Purpose designed, factory built and tested drives for air/gas flow control dampers on burner, heater, boiler and turbine systems in power plants, refineries and a wide range of industrial applications.

Combining the proven performance of Kinetrol's vane type actuator with an equally rugged integral manual override/mounting frame, the G3 drive is compact with unbeatable control, accuracy and cycle life.

ATEX Category 2

Features

- **Integral manual override**
- **Suitable for new installations or replacement of existing electric or pneumatic drives**
- **Available with same mounting foot print to replace existing floor mount drives**
- **Can result in lower energy costs resulting from accurate flow control**
- **Reduced operating costs due to long maintenance-free life (2 million operation warranty)**
- **Compact space saving design**
- **Quick and easy installation and set up**
- **Robust construction with durable epoxy finish**
- **Manual override usable with actuator removed**

Options

- Double acting and spring fail-safe (open or closed)
- Modulating (3-15 psi and 4-20mA signal)
- Fail to low signal
- Lock in last position
- Limit switch remote position indication
- 4-20mA angle retransmission
- High visibility position indication
- Different sided/diameter handwheels and extensions
- Infinitely adjustable output levers to suit existing or new requirements
- High temperature option available

Materials of Construction

Casing:
Models 0M0, 01, & 02 - Pressure die cast ZL16 zinc alloy.
Models 03, 05, 07, 08, 09, 10, 12, 14, 15, 16, 18, 21, 30, 40 & 60 - Die cast or sand cast aluminium alloy.

Vane & Output Shaft:
Models 0M0, 01, 02, 03 and 05 - Stainless steel.
Models 07 to 60 - SG iron, zinc plated.

Shaft bushes: PTFE coated bronze (lead free).

Seals: Moulded polyurethane.
High and low temperature seals also available - contact Kinetrol.

Seal expanders: Stainless spring steel.

Couplings: Weldable mild steel, zinc plated.

Working Temperature Range

Standard: -40°C to +80°C (-40°F to +176°F).

High temperature option: -20°C to +100°C (-4°F to +212°F) using temperature seals for higher temperatures with special equipment - contact Kinetrol.

If consulted Kinetrol may, under certain circumstances/conditions, be prepared to extend its high temperature limits

Low temperature option: -54°C to +60°C (-65°F to +140°F) using temperature seals include option “W” at end of actuator coding.

Maximum Pressure

Maximum recommended working pressure: 7 bar / 100 psi

Maximum overload pressure: 10 bar / 150 psi

Certification

ISO 9001:2015
Certificate No. FM22163

ATEX

IECEX

FACTORY MUTUAL USA & CANADA
APPROVED

SAFETY INTEGRITY LEVEL
Safety Integrity Level SIL

DNV-GL
(UPON REQUEST)

Kinetrol Double Acting Torque Outputs

Double Acting Torque Outputs - Metric Units Nm

Actuator Model	Pressure (bar) 1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
0M0-100	0.1	0.2	0.25	0.35	0.4	0.5	0.55	0.6	0.7	0.75	0.85	0.9
01-100	1.1	1.6	2.1	2.6	3.0	3.5	4.0	4.5	5.1	5.6	6.1	6.7
02-100	1.8	2.7	3.6	4.6	5.5	6.4	7.3	8.2	9.2	10.2	11.1	12.1
03-100	3.9	5.8	7.6	9.6	11.5	13.4	15.4	17.4	19.3	21.3	23.2	25.3
05-100	9.0	12.5	16.5	20.0	24.0	27.5	31.5	35.0	39.0	43.0	46.5	50.5
07-100	22.0	30.5	39.5	48.5	57.5	66.5	76.0	85.5	95.0	105.0	114.0	124.0
08-100	38.7	53.2	67.7	82.3	96.8	111.4	125.9	140.5	155.0	169.0	184.1	198.7
09-100	46	64	83	102	121	140	159	179	199	220	241	261
10-100	80	111	141	172	202	232	263	294	325	355	385	416
12-100	103	147	190	232	275	319	360	403	446	490	532	575
14-100	265	360	460	560	660	760	870	975	1080	1180	1280	1375
15-100	435	605	769	937	1109	1287	1457	1632	1808	1982	2153	2337
16-100	640	860	1090	1310	1530	1750	1980	2200	2420	2650	2870	3100
18-100	1250	1750	2250	2750	3250	3750	4300	4850	5400	5950	6400	6900
21-100	2624	3623	4544	5568	6516	7553	8521	9523	10553	11561	12543	13589
30-100	3720	5160	6600	7695	9435	10845	12240	13635	15030	16440	17835	19140
40-100	6130	8012	9853	11935	13830	16600	18030	20050	21990	24162	26203	28150
60-100	8345	11106	14041	16680	19673	22806	25680	28870	31995	34909	37818	40765

Double Acting Torque Outputs - English Units lbf ins

Actuator Model	Pressure (psi) 20	30	40	50	60	70	80	90	100
0M0-100	1	2	3	3.5	4.5	5	6	7	8
01-100	9	15	21	26	32	39	45	51	58
02-100	14	25	36	48	59	70	82	93	105
03-100	29	53	77	101	124	148	173	196	220
05-100	70	116	160	205	250	300	346	393	440
07-100	175	280	390	500	610	730	850	960	1080
08-100	311	488	666	826	1012	1208	1367	1563	1740
09-100	360	590	820	1050	1280	1530	1780	2020	2280
10-100	640	1020	1390	1760	2130	2500	2880	3250	3625
12-100	830	1350	1870	2400	2900	3440	3970	4480	5000
14-100	2150	3350	4550	5800	7000	8300	9600	10800	12000
15-100	3558	5602	7593	9700	11753	13895	15991	18125	20337
16-100	5200	7900	10600	13400	16100	18800	21600	24300	27000
18-100	10000	16100	22200	28300	34500	41300	48000	54500	60000
21-100	22286	33234	44962	57078	68930	81223	93402	105784	118503
30-100	30000	48000	64500	81750	99000	117000	133500	150750	168000
40-100	50626	72780	96854	121167	142435	170997	195204	221270	246362
60-100	67602	102031	135487	173262	208807	245953	283879	319645	356977

Kinetrol Spring Return Torques

Spring Return Torque Outputs - English Units lbf ins

Actuator Model	Position of air OR spring return stroke	Pressure (psi) 25	30	35	40	45	50	55	60	65	70	75	80
01-120	Start						13		15		17		20
	Finish						8		10		13		16
02-120	Start						27	30	32	34	37	39	42
	Finish						12	15	18	21	25	29	33
03-120-5600	Start	25	30	36	42	47	50						
	Finish	19	25	31	37	42	45	*45*	*45*	*45*	*45*	*45*	*45*
03-120 / 03-1C0	Start						56	61	66	71	79	84	91
	Finish						37	41	49	56	64	69	77
05-120 / 05-1C0	Start						115	125	135	145	160	170	185
	Finish						75	85	100	115	130	140	155
07-120-4000	Start	80	105	135	165	195							
	Finish	45	75	105	135	160	*160*	*160*	*160*	*160*	*160*	*160*	*160*
07-120 / 07-1C0	Start						270	300	330	360	385	415	450
	Finish						175	210	240	270	305	340	375
08-120	Start						466	506	546	595	644	682	720
	Finish						326	366	406	455	504	542	580
09-120-4200	Start	230	280	330	390	450							
	Finish	130	190	250	310	370	*370*	*370*	*370*	*370*	*370*	*370*	*370*
09-120	Start						540	600	660	725	790	855	925
	Finish						445	500	565	630	700	765	830
10-120-5800	Start	500	587	683	760	886	953						
	Finish	366	472	568	645	780	847	*847*	*847*	*847*	*847*	*847*	*847*
10-120	Start						950	1025	1100	1190	1280	1365	1450
	Finish						690	795	900	1000	1100	1185	1270
12-120-4300	Start	480	610	740									
	Finish	380	510	640	*640*	*640*	*640*	*640*	*640*	*640*	*640*	*640*	*640*
12-120-4400	Start			790	910	1040	1170	1300	1430	1560	1690		
	Finish			585	710	840	970	1100	1230	1360	1490	1490	1490
12-120	Start						1280	1415	1555	1690	1825	1960	2110
	Finish						985	1125	1260	1400	1540	1670	1810
14-120-4900	Start	1700	1950	2200	2550	2850	3150	3450	3750	4150	4400	4680	4680
	Finish	1050	1400	1650	1950	2250	2550	2850	3150	3450	3700	3960	3960
14-120	Start						3310	3610	3915	4240	4580	4900	5200
	Finish						2205	2570	2920	3250	3595	3920	4230
14-120-5000	Start	1520	1840	2100									
	Finish	1240	1540	1750	*1750*	*1750*	*1750*	*1750*	*1750*	*1750*	*1750*	*1750*	*1750*
15-1C0	Start						5434	6018	6656	7089	7505	8090	8514
	Finish						3469	4098	4620	5222	5806	6399	6992
16-120-6100	Start	3178	3790	4401									
	Finish	2172	2950	3729	*3729*	*3729*	*3729*	*3729*	*3729*	*3729*	*3729*	*3729*	*3729*
16-120-6000	Start			4551	5163	5774	6386						
	Finish			3579	4357	5136	5914	*5914*	*5914*	*5914*	*5914*	*5914*	*5914*
16-120	Start						7646	8310	8885	9708	10310	11116	11691
	Finish						5098	5841	6567	7363	8018	8868	9567
18-120-7000	Start	7142	8585	10461	11151								
	Finish	4283	6514	8558	9204	*9204*	*9204*	*9204*	*9204*	*9204*	*9204*	*9204*	*9204*
18-120	Start				12894	14487	16594	18169	19523	21470	22877	24780	26143
	Finish				7735	9169	11063	12753	14426	16284	17797	19771	21390
21-120-8000	Start	14346	17169	20576	23824								
	Finish	9071	12054	15603	19497	*19497*	*19497*	*19497*	*19497*	*19497*	*19497*	*19497*	*19497*
21-120-7300	Start				24674	27187	30718	33090	35604				
	Finish				17328	20098	23293	26400	29125	*29125*	*29125*	*29125*	*29125*
21-120	Start								36471	39949	42462	45852	48286
	Finish								26957	30294	33028	36577	39506
30-120-7600	Start	16797	25470	30674	35736								
	Finish	9394	18824	23860	29240	*29240*	*29240*	*29240*	*29240*	*29240*	*29240*	*29240*	*29240*
30-120-8300	Start				36391	40303	45250						
	Finish				27594	31347	*37020*	*37020*	*37020*	*37020*	*37020*	*37020*	*37020*
30-120-7800	Start						46347	50233	53737	58835			
	Finish						34258	38090	42869	48144	*48144*	*48144*	*48144*
30-120	Start									59923	63693	68782	72428
	Finish									45436	49542	54870	59260
40-120-8300	Start					59407	66708	71833	77630				
	Finish					49600	55698	59973	64806	64806	64806	64806	64806
40-120	Start									86968	93190	99633	106077
	Finish									72612	77807	83180	88552
60-120-8400	Start				73841	84134	94428						
	Finish				61647	70240	*78834*	*78834*	*78834*	*78834*	*78834*	*78834*	*78834*
60-120-8500	Start						94428	104114	113800	123872			
	Finish						78834	86921	95007	103416	*103416*	*103416*	*103416*
60-120	Start									123872	134045	144379	154333
	Finish									103416	111909	120537	128847

Torque outputs identical for counter-clockwise models. *Italic* figures apply to spring end torque only - air end torque will be greater.
Factory assembled actuator/spring return assemblies have the spring pretension set for "balanced" torque output when the actuator is operated by air at 80 psi.
Factory assemblies can be preset for different air pressures below 80 psi on request.

Kinetrol Spring Return Torques

Spring Return Torque Outputs - Metric Units Nm

Actuator Model	Position of air OR spring return stroke	Pressure (bar) 1.7	2.0	2.4	2.8	3.1	3.5	3.8	4.1	4.5	4.8	5.2	5.5
01-120	Start						1.5		1.7		1.9		2.3
	Finish						0.9		1.1		1.5		1.8
02-120	Start						3.0	3.4	3.6	3.8	4.2	4.4	4.7
	Finish						1.4	1.7	2.0	2.4	2.8	3.3	3.7
03-120-5600	Start	2.8	3.4	4.1	4.8	5.3	5.7						
	Finish	2.1	2.8	3.5	4.2	4.8	5.1	*5.1*	*5.1*	*5.1*	*5.1*	*5.1*	*5.1*
03-120 / 03-1C0	Start						6.3	6.9	7.5	8.1	8.9	9.5	10.3
	Finish						4.1	4.7	5.5	6.4	7.2	7.8	8.7
05-120 / 05-1C0	Start						13.0	14.1	15.3	16.4	18.1	19.2	20.9
	Finish						8.5	9.6	11.3	13.0	14.7	15.8	17.5
07-120-4000	Start	9.0	11.9	15.3	18.6	22.0							
	Finish	5.1	8.5	11.9	15.3	18.0	*18.0*	*18.0*	*18.0*	*18.0*	*18.0*	*18.0*	*18.0*
07-120 / 07-1C0	Start						30.5	33.9	37.3	40.7	43.5	46.9	50.8
	Finish						19.8	23.7	27.1	30.5	34.4	38.4	42.4
08-120	Start						52.7	57.2	61.7	67.2	72.7	77.0	81.3
	Finish						36.8	41.3	45.8	51.4	56.9	61.2	65.5
09-120-4200	Start	26.0	31.6	37.3	44.1	50.8							
	Finish	14.7	21.5	28.2	35.0	41.8	*41.8*	*41.8*	*41.8*	*41.8*	*41.8*	*41.8*	*41.8*
09-120	Start						61.0	67.8	74.6	81.9	89.3	96.6	104.0
	Finish						50.3	56.5	63.8	71.2	79.1	86.4	93.8
10-120-5800	Start	56.0	65.0	77.0	89.0	97.0	108.0						
	Finish	41.8	52.0	64.0	77.2	86.9	100.0	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
10-120	Start						107.0	115.5	124.0	136.0	145.0	155.9	164.0
	Finish						78.0	90.0	102.0	114.6	124.0	134.9	143.0
12-120-4300	Start	54.0	68.9	83.6									
	Finish	42.9	57.6	72.3	*72.3*	*72.3*	*72.3*	*72.3*	*72.3*	*72.3*	*72.3*	*72.3*	*72.3*
12-120-4400	Start			89.3	103.0	117.0	132.0	147.0	161.0	176.0	191.0		
	Finish			66.1	80.2	94.9	110.0	124.0	139.0	154.0	168.0	168.0	168.0
12-120	Start						145.0	160.0	176.0	191.0	206.0	221.0	238.0
	Finish						111.0	127.0	142.0	158.0	174.0	189.0	204.0
14-120-4900	Start	192.0	220.0	249.0	288.0	322.0	356.0	390.0	424.0	469.0	497.0	529.0	529.0
	Finish	119.0	158.0	186.0	220.0	254.0	288.0	322.0	356.0	390.0	418.0	447.0	447.0
14-120	Start						374.0	408.0	442.0	479.0	517.0	554.0	588.0
	Finish						249.0	290.0	330.0	367.0	406.0	443.0	478.0
14-120-5000	Start	172.0	208.0	237.0									
	Finish	140.0	174.0	198.0	*198.0*	*198.0*	*198.0*	*198.0*	*198.0*	*198.0*	*198.0*	*198.0*	*198.0*
15-1C0	Start						614.0	680.0	752.0	801.0	848.0	914.0	962.0
	Finish						392.0	392.0	522.0	590.0	656.0	723.0	790.0
16-120-6100	Start	359.0	428.0	497.0									
	Finish	245.0	333.0	421.0	*421.0*	*421.0*	*421.0*	*421.0*	*421.0*	*421.0*	*421.0*	*421.0*	*421.0*
16-120-6000	Start			514.0	583.0	652.0	722.0						
	Finish			404.0	492.0	580.0	668.0	*668.0*	*668.0*	*668.0*	*668.0*	*668.0*	*668.0*
16-120	Start						864.0	939.0	1004.0	1097.0	1165.0	1256.0	1321.0
	Finish						576.0	660.0	742.0	832.0	906.0	1002.0	1081.0
18-120-7000	Start	807.0	970.0	1182.0	1260.0								
	Finish	484.0	736.0	967.0	1040.0	*1040.0*	*1040.0*	*1040.0*	*1040.0*	*1040.0*	*1040.0*	*1040.0*	*1040.0*
18-120	Start				1457.0	1637.0	1875.0	2053.0	2206.0	2426.0	2585.0	2800.0	2954.0
	Finish				874.0	1036.0	1250.0	1441.0	1630.0	1840.0	2011.0	2234.0	2417.0
21-120-8000	Start	1621.0	1940.0	2325.0	2692.0								
	Finish	1025.0	1362.0	1763.0	2203.0	*2203.0*	*2203.0*	*2203.0*	*2203.0*	*2203.0*	*2203.0*	*2203.0*	*2203.0*
21-120-7300	Start				2788.0	3072.0	3471.0	3739.0	4023.0				
	Finish				1958.0	2271.0	2632.0	2983.0	3291.0	*3291.0*	*3291.0*	*3291.0*	*3291.0*
21-120	Start								4121.0	4514.0	4798.0	5181.0	5456.0
	Finish								3046.0	3423.0	3732.0	4133.0	4464.0
30-120-7600	Start	2433.0	2878.0	3466.0	4038.0								
	Finish	1622.0	2127.0	2696.0	3304.0	*3304.0*	*3304.0*	*3304.0*	*3304.0*	*3304.0*	*3304.0*	*3304.0*	*3304.0*
30-120-8300	Start				4112.0	4554.0	5113.0						
	Finish				3118.0	3542.0	*4183.0*	*4183.0*	*4183.0*	*4183.0*	*4183.0*	*4183.0*	*4183.0*
30-120-7800	Start						5237.0	5676.0	6072.0	6648.0			
	Finish						3871.0	4304.0	4844.0	5440.0	*5440.0*	*5440.0*	*5440.0*
30-120	Start									6771.0	7179.0	7772.0	8184.0
	Finish									5134.0	5598.0	6200.0	6696.0
40-120-8300	Start					6712.0	7537.0	8116.0	8771.0				
	Finish					*5604.0*	*6293.0*	*6776.0*	*7322.0*	*7322.0*	*7322.0*	*7322.0*	*7322.0*
40-120	Start									9826.0	10529.0	11257.0	11985.0
	Finish									*8204.0*	*8791.0*	*9398.0*	*10005.0*
60-120-8400	Start				8343.0	9506.0	10669.0						
	Finish				6965.0	7936.0	*8907.0*	*8907.0*	*8907.0*	*8907.0*	*8907.0*	*8907.0*	*8907.0*
60-120-8500	Start						10669.0	11763.0	12858.0	13996.0			
	Finish						8907.0	9821.0	10734.0	11684.0	*11684.0*	*11684.0*	*11684.0*
60-120	Start									14001.0	15145.0	16313.0	17437.0
	Finish									11689.0	12644.0	13619.0	14558.0

Torque outputs identical for counter-clockwise models. *Italic* figures apply to spring end torque only - air end torque will be greater.
Factory assembled actuator/spring return assemblies have the spring pretension set for "balanced" torque output when the actuator is operated by air at 5.5 bar.
Factory assemblies can be preset for different air pressures below 5.5 bar on request.

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