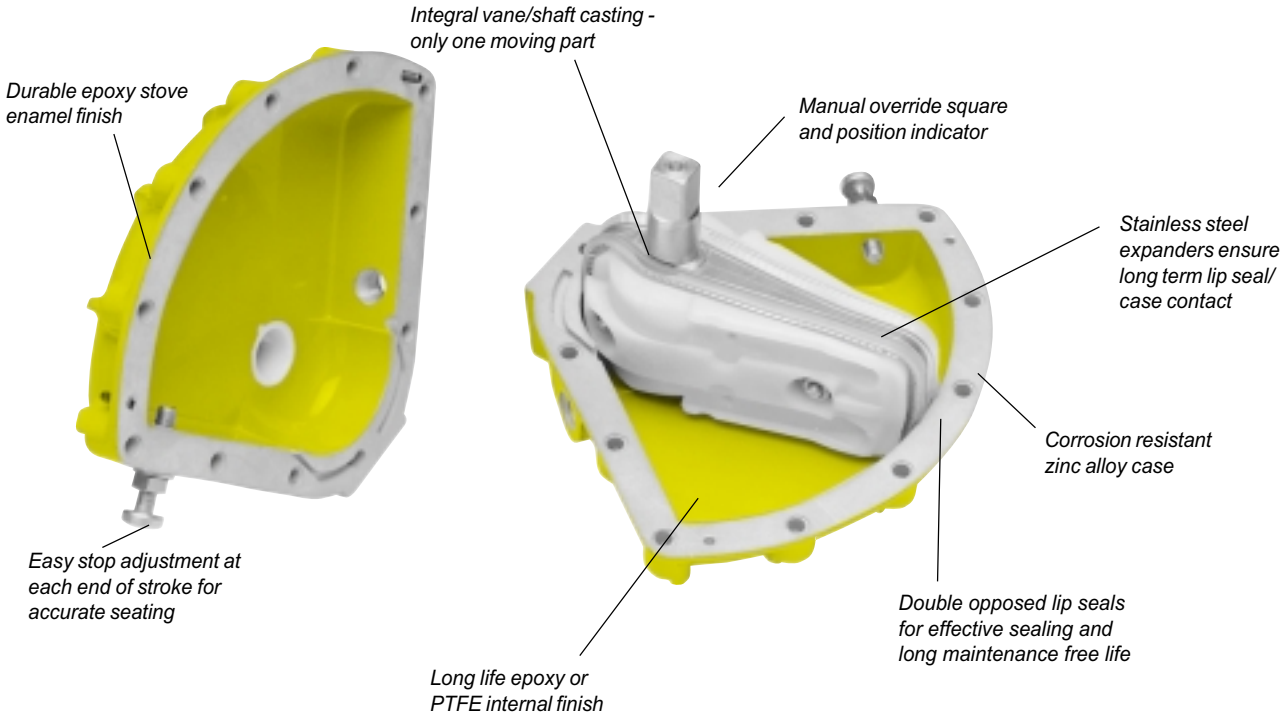
KINETROL

rotary actuators

vane actuators

- **Single moving part**
  Simplest and most reliable mechanism for quarter-turn rotary actuation.
- **Direct mounting control modules**
  Fail-safe spring returns, limit switches, positioners, solenoid valves, all just bolt on direct.
- **No cranks or gearing**
  No power loss or backlash - allows accurate positioning.
- **Durable corrosion resistant finish**
- **Long maintenance-free life**
  Up to 4 million operations guaranteed.
- **Compact - space saving - efficient**
  Best torque/size package available, fast operating speeds, best air consumption, proven design.
- **Hundreds of thousands of units**
  in trouble free service all over the world
- **Choice of male or female output drive square - easy to interface to application**



Kinetrol's rigorous quality programme, approved to ISO 9002, ensures that each unit is manufactured to high standards. Every actuator is tested before leaving the factory.

Certificate No. FM 22163

applications

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

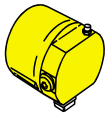
FOR CONTENTS GUIDE SEE PAGE 42
FOR ORDERING CODES SEE PAGE 32

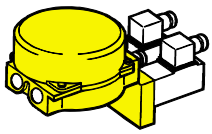
modular ‘add on’ control units

Visual Indicator
Gives visual indication of valve position, as standard except OMO, 08, 16, 18 and 20.

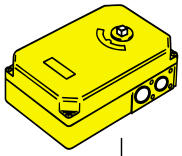
3-Stop Positioner
Provides two endstop positions and a mid-range setpoint anywhere within the 90° span. Easy setpoint adjustment and integral position feedback options (details page 10).

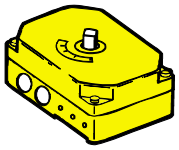
I/P Controller
4 to 20 mA electrical signal controls main air supply to pneumatic positioner as alternative to air signal control (details page 9).





EL Electropneumatic Positioner
A single unit gives smooth accurate control in response to a 4 to 20 mA signal. Limit switch and angle retransmit options in same housing (details page 11/12).



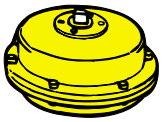


AP Positioner
3 to 15 psi (0.2 to 1 bar) air signal controls main air supply to *TURN, STOP* or *HOLD* actuator in proportional response to that air signal. Limit switch and angle retransmit options (details pages 7/8).

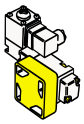
Clear Cone Position Monitor
Gives 360º and overhead position indication. Available on actuator and EHD models 05, 07, 09 and 10. Limit Switch boxes from 05, and on AP and EL Positioners (details page 6).

Limit Switch Box
Weathertight unit with up to 4 micro-switches for remote position indication or control use. Optional switches for flameproof/explosionproof needs and high visibility Clear Cone position monitor (details page 5).

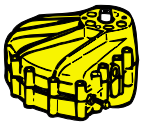
Spring Return Unit
Clock type spring gives reliable fail safe operation with high torque output throughout spring stroke, yet has easy adjustment to suit application (details pages 3/4).

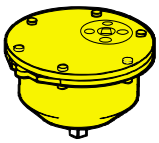


Actuator
14 sizes covering torque range 5 lbf in (0.5 Nm) to 112,000 lbf in (12760 Nm). Operating air pressure range 20 psi (1.4 bar) to 100 psi (7 bar). Adjustable stops standard. Restricted travel stops and DIN/ISO versions available for most models (details pages 18 to 31).

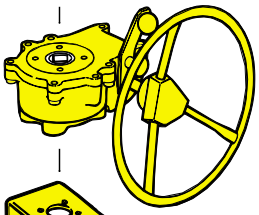


Solenoid
Optional integral pneumatic solenoid valve for actuators. Various electrical, environmental and explosionproof requirements covered (details page 6).

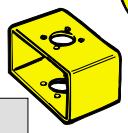




180° Rotary Actuator
Compact units give constant torque output through up to 200° travel (details page 13/14).



Gearbox
Geared manual override available on all models from 05 to 16 inclusive (details page 17).



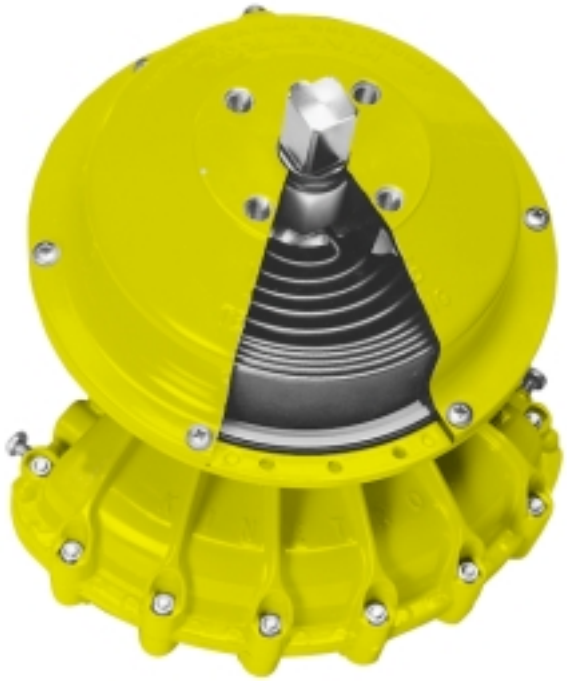
Mounting Bracket
A comprehensive range of brackets provides for most ball, plug and butterfly valves (details page 41).

Manual Override
All actuators and most combination assemblies have a square drive shaft extension at the top for emergency manual operation except positioners (details page 17).

.....Kinetrol modular concept easily provides the control assembly needed

fail safe spring return unit

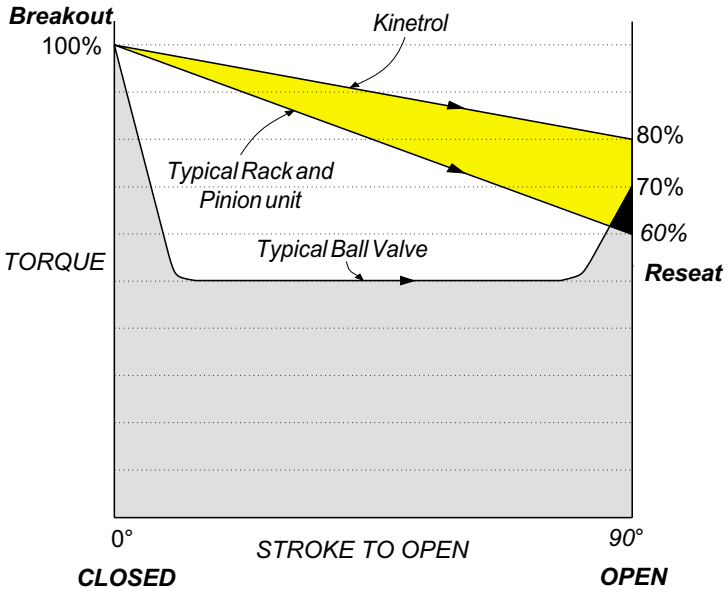
- **Lowest torque loss**
  Typically 20% through 90° yields extra torque through spring stroke - enables the selection of smaller actuators (see diagram).
- **Reliable low stress range clock type spring**
- **Separate housing for modular assembly**
  Easily retrofitted.
- **Sealed, non-breathing housing**
  Protects spring in corrosive environments.
- **Adjustable pretension for 'balanced' air and spring stroke torques**
  Combinations available for balanced/optimised torques at various air pressures.
- **Some models with optional worm drive pretension adjustment**
- **Keeper plates available to ensure safe handling**
- **Some models available with optional ISO/DIN female drive and mounting**



Spring Housing cut away

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 graphs demonstrate 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 rack and pinion actuators (end of stroke torque can be as low as 30% of start of stroke) dictate the selection of larger units to ensure complete reseating.



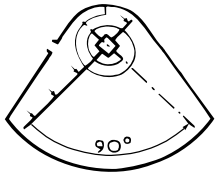
fail safe spring return unit

Direction of Spring Action

Spring units are available for either clockwise or counter clockwise spring action.

Direction is determined looking down at the top of the spring unit towards the valve.

Suffix - 020 = clockwise
Suffix - 030 = counter clockwise



Pretension Setting

Factory assembled actuator/spring return assemblies have the spring return pretension set for 'balanced' torque output when the actuator is operated by air at 80psi (5.5bar).

Factory assemblies can be preset for different air pressures below 80psi (5.5bar) on request.

Spring return units supplied separate from actuators are also pretensioned for 80psi (5.5bar) air operation.

Asymmetrical Torque Applications

If high torque is required in one direction and lower torque in the other direction this can be set up easily by changing spring pretension to be higher or lower as required. Air stroke start torque will always be double-acting torque (at air pressures available) less spring pretension torque.

Keeper Plates

These are provided on all pretensioned spring return units supplied separate from actuators. They are also available as spare parts.

A keeper plate must always be used to restrain spring tension whenever a spring return unit case is dismantled.

low air pressure applications

If air pressure available for actuator operation is less than 50 psi (3.5bar) 'balanced' torque output on air and spring strokes is still possible by using a spring return unit from a smaller actuator size. Listed below are factory assembled options of this kind.

Replace the ' * ' used in the ordering codes listed below with a '2' (clockwise) or '3' (counter clockwise) depending on direction of spring action required.

Ordering Code	Description
03-1*0-5600	03 actuator with one 02 spring unit
07-1*0-4000	07 actuator with one 05 spring unit
08-1*0-4100	08 actuator with one 07 spring unit
09-1*0-4200	09 actuator with one 07 spring unit
10-1*0-5800	10 actuator with one 09 spring unit
12-1*0-4300	12 actuator with one 09 spring unit
12-1*0-4400	12 actuator with two 09 spring units
14-1*0-4900	14 actuator with two 12 spring units
14-1*0-5000	14 actuator with one 12 spring unit
16-1*0-6000	16 actuator with one 14 spring unit and one 12 spring unit
16-1*0-6100	16 actuator with one 14 spring unit
18-1*0-7000	18 actuator with one 16 spring unit
20-1*0-7200	20 actuator with two 16 spring units
20-1*0-7300	20 actuator with three 16 spring units

materials specifications

Spring casing	Models 01, 02, 03, 05, 07, 08, 09 , 10 & 12 pressure die-cast in BS1004 zinc alloy. Models 14, 16, 18 & 20 aluminium alloy LM25.
Finish	Epoxy stove enamel.
Spring	Clock type spring steel.
Square	Steel, zinc plated.
Mount Holes (on top)	Same as matching actuator except model 01 and low pressure combinations (see page 35).

ENGLISH DIMENSIONS see page 35

limit switch units

- **Provide reliable open/close indication**
- **All units sealed to IP65/NEMA 4**
- **Precision die-cast, zinc alloy boxes**
- **Two easily adjustable strikers**
- **Available for all models except OMO and 01**
- **Cable entry threads**
  Optional ISO M20x 1.5, Din Pg
  13.5 and ½"-14NPS. See page 32 for full details of coding
- **Discrete limit switch boxes available with latchable or non - latchable handles.**
  (contact Kinetrol for details)

Resistive load ratings for standard microswitches:

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

standard switches

- **Code-004**
  With 2 microswitches wired for SPDT.
  NB 02/03 and positioner models wired for SPST (normally open unless otherwise specified). May be used in zone 0 with intrinsically safe supply.
- **Code-007**
  With 4 microswitches wired for DPDT.
  NB not applicable to 02/03 and positioner models.

optional switches

- **Code-001**
  2 intrinsically safe inductive proximity sensors for hazardous areas to Zone 0.

- **Code-002**
  2 pneumatic switches with inlet adaptors for 4mm i/d tube.

- **Code-005**
  2x2 wire proximity sensors 20-260 volts AC, normally open.
- **Code-006**
  2x2 wire proximity sensors 5-60 volts DC, normally open, with LED switch status indicators.

- **Code-003**
  Certificated unit to EEx e II T6 for hazardous areas to Zone 1.

INSTALLATION DIMENSIONS see page 36

clear cone monitor

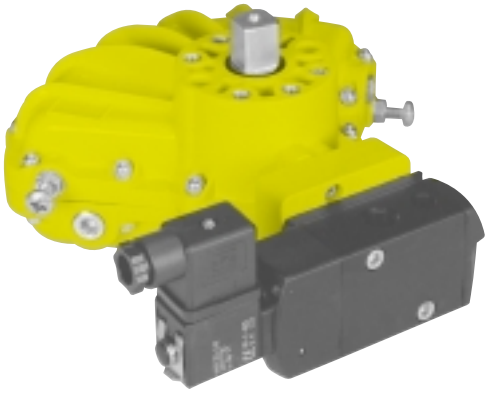
Optional CLEAR CONE provides all round high visibility position monitoring on all limit switch boxes except Code-003 type, 02/03 and positioner models. A colour coded indicator is sealed inside a robust, chemical resistant, clear polycarbonate cover.

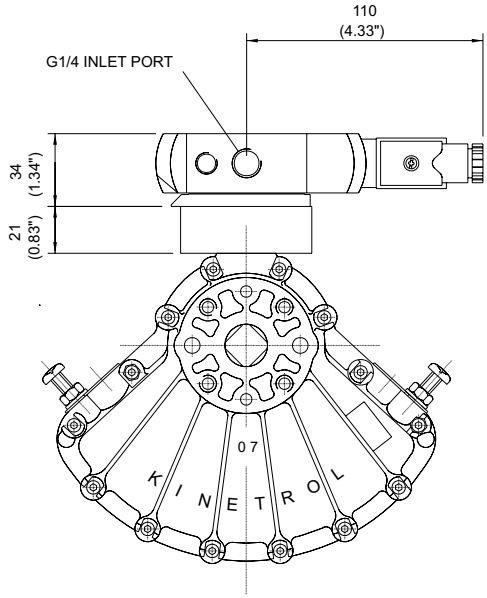
To order, add suffix 'M' to ordering codes eg -004M.

For highly corrosive enviroments special cover materials are available. Contact Kinetrol for details.

INSTALLATION DIMENSIONS see page 36

solenoid valves





Single solenoid, spring return, interchangeable 3 or 5 port, NAMUR interface.
Most brands of NAMUR interface solenoid valve can be supplied to special order.

As an option KINETROL actuators sizes 03 to 14 can be supplied with integral solenoid valves with NAMUR interface. Air is ported through the actuator body via an adaptor plate so no external tubing is necessary.

Standard optional solenoid valves can be converted to 5 or 3 port versions by changing the valve body plate supplied with the unit.

specification

Coil voltages	AC: 50/60 Hz 24, 115 & 230 volts DC: 24 volts For other voltages contact Kinetrol
Electrical connection	DIN 43650 plug with Pg9 cable gland (6 to 8mm dia) as standard
Manual override	Extra to order
Exhaust silencers /flow regulators	Extra to order
Hazardous areas	Certificated solenoids are available as extras to order
Environmental protection	To IP65 as standard
Minimum air supply	2 bar

AP positioner

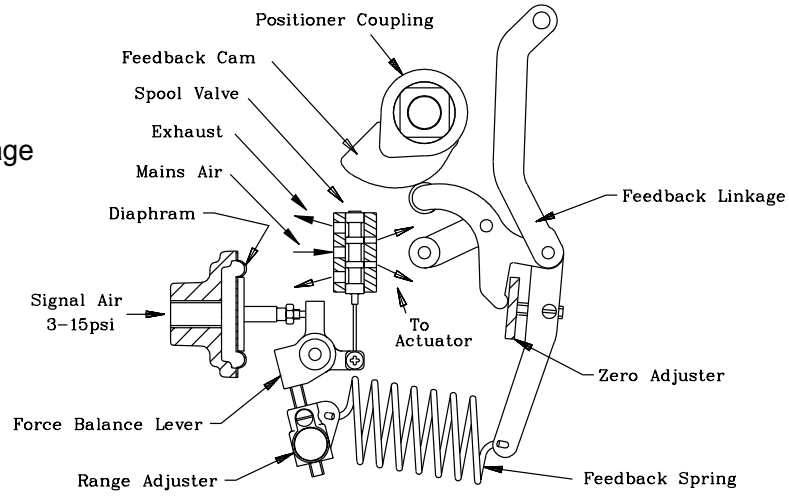
The AP Positioner moves an actuator to a position set by a 3 - 15 psi control signal and holds it there. Its features are:

- **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 setup**
  Quick calibration and reversal of rotational sense (clockwise/anticlockwise) without special tools or parts change
- **Integral options - easily retrofitted modules 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
  - DIN plug for external retransmit connection
  - low (-40°C) and high (100°C) temperature adaptations available
  - fail hold options available
  - Built in air ports for supply, gauge and actuator connections
  - Choice of mount options - see opposite page
- **Weatherproof, compact and robust metal housing**
- **Vibration and shock resistant to 4G**
- **Built in gauge ports / external connections**

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 diaphram and moves the spool valve to its held 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.



AP positioner - application

The AP positioner can be directly mounted on special versions of Kinetrol model 05, 07, 09, 10, 12 and 14 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 and 20.

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 7.0 bar, 50 psi to 100 psi standard.
Consult Kinetrol for low pressure application

Signal 3-15 psi (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
AP: 3.3 scfm (93 nl/min) @5.5 bar
MP:10.0 scfm (283 nl/min) @5.5 bar
HP: 27.0 scfm (764 nl/min) @5.5 bar

Operating temperature range
-20° to 80°C standard
-20° to 100°C Viton
-50° to 50°C silicone

Weight 2.8 kg / 6.2 lb

Materials
case and cover - zinc alloy
spool and liner - stainless steel
diaphragm -polyester reinforced polyurethane, Viton or silicone rubber
feedback spring - steel

Finish epoxy stove enamel

Enclosure ratng IP54

Output torque same as double acting or spring return actuator. When controlling fast movement of inertia loads, consult Kinetrol

Vibration tolerance 4G, 100 Hz

I/P convertor options
Non-hazardous
CENELEC EEx d IIC T6
FM Class 1 Division 1 explosion proof Groups B, C, D Intrinsically safe Groups A, B, C, D, E, F, G
CSA Class 1 Division 1 explosion proof Groups B, C, G Intrinsically safe Groups A, B, C, D

travel times

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

Model	05	07	09	10	12	12*
Deg/Sec	180	90	45	33	25	32

Model	14	14*	16*	18*	20*
Deg/Sec	10.6	13.8	22.5	11.3	5.6

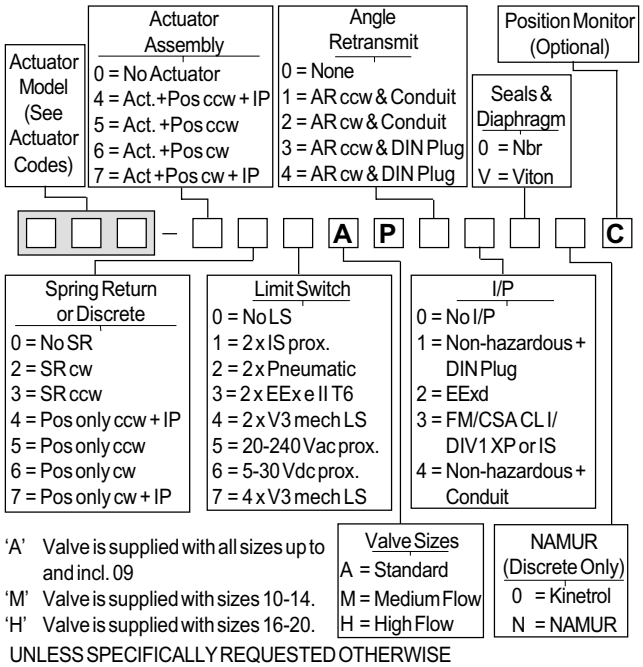
*** Externally piped**

cam options

Giving typical control characteristics

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

ordering codes



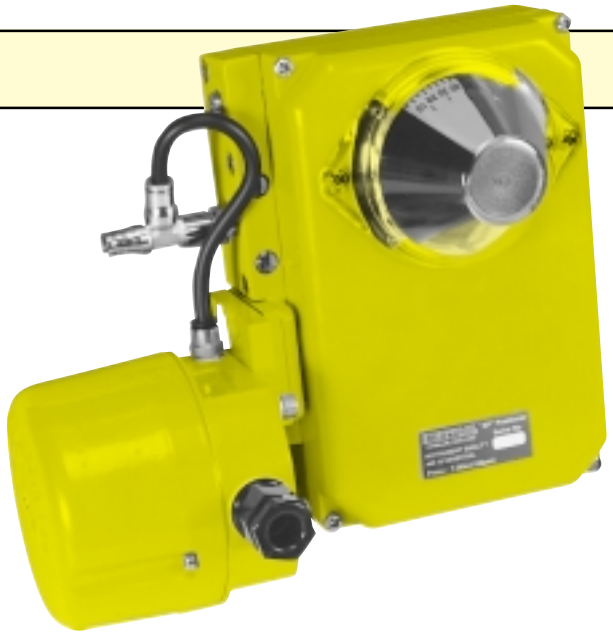
'A' Valve is supplied with all sizes up to and incl. 09
'M' Valve is supplied with sizes 10-14.
'H' Valve is supplied with sizes 16-20.

UNLESS SPECIFICALLY REQUESTED OTHERWISE

Recommended spring unit for model 14 actuator is 4900 type. This should be coded 12 ☐ 49MP or 13 ☐ 49MP instead of the usual 12 ☐ MP or 13 ☐ MP. The same applies to other specially coded spring assemblies.

INSTALLATION DIMENSIONS see page 37

I/P controller



The optional KINETROL I/P Controller is mounted in place of the standard diaphragm housing on the side of the positioner case. The positioner can still be mounted in any attitude and gives an angular output position which is proportional to the input current control signal between 4 and 20 milliamps.

The 4–20 mA signal is converted to an air pressure by a coil and magnet and flapper valve arrangement. This air pressure controls the positioner in the normal way.

Air supply to the unit is taken from the same constant 80 psi/5.5 bar supply as the positioner, no pressure reduction required.

Zero and range adjustment is done within the positioner in the same way as with a standard pneumatic positioner. No adjustment is necessary within the I/P Controller. The cover is removed only to connect the two wires - this is not necessary with the DIN plug option.

specification

Electrical control signal	4 - 20 mA
Coil impedance	20 ohms typical
Cable entry	16mm conduit or gland (mini DIN plug, IP65 with Pg9 cable gland, 6 to 8mm dia optional)
Air supply	80 psi / 5.5 bar nominal
Air entry	G1/8" (fitted with 6mm pipe dia. push-in connector
Linearity	1.5% *
Hysteresis	less than 1% *
Sensitivity/deadband	less than 1% *
Supply pressure influence	0.2% psi between 80 and 60 psi
Quiescent air consumption	2.5 - 3.5 l/min free air
Working temperature range	-20°C to 80°C

Instrument quality dry clean air obligatory (class 3.4.4 ISO 8573.1)

* These figures are typical when fitted to a Kinetrol positioner and actuator.

I/P controller hazardous area

Kinetrol offers two optional I/P converters which are explosion proof and intrinsically safe certified for CENELEC zones 1 & 2 and NEC and CSA CLASS I DIVISION use.

Certificated as follows

CENELEC	explosion proof EExd II T6
	intrinsically safe EEx ia II C T4/T5/T6
NEC	FM explosion proof CLI/DIV 1/GRP B C D
& CSA	FM intrinsically safe CLI/DIV 1/GRP A B C D E F G
	CSA explosion proof CLI/DIV 1/GRP B C G

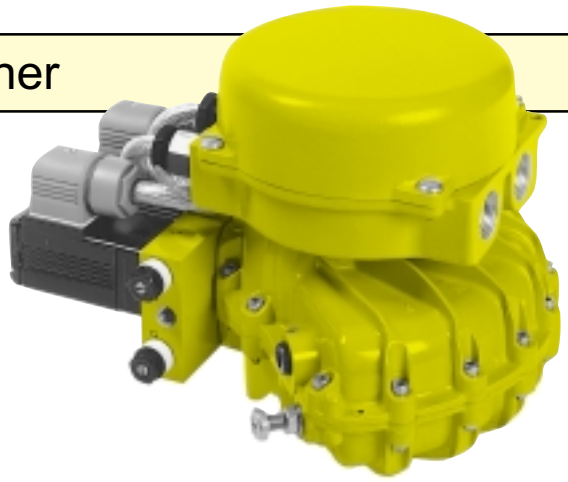
specification - hazardous area

Electrical control signal	4 - 20 mA
Input resistance	260 ohms at 20°C
Cable entry	EExd - M20 x 1.5 conduit entry FM/CSA - 1/2" NPT conduit entry
Air supply	80 psi / 5.5 bar nominal
Air entry	EExd (AP & MP) G1/4" (HP) 3/8" NPT
Supply pressure regulation	20 to 150 psi/1.4 to 10 bar
Working temperature range	-40°C to 85°C

Instrument quality dry clean air obligatory (class 3.4.4 ISO 8573.1)

INSTALLATION DIMENSIONS see page 37

3-stop pneumatic positioner



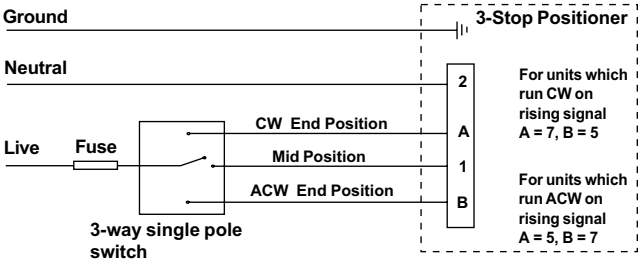
- **3 position control using only 4 wires plus air supply** (for more than 3 positions - contact Kinetrol)
- **Mid position setpoint anywhere in angular range**
- **Direct mounting onto standard Kinetrol $^{1}/_{4}$ turn actuators** - Double acting or spring return, models 05 to 09 (models 10 to 14 need special actuators).
- **Easy adjustment of setpoint by choice of methods selected by links** - On-board potentiometer, external potentiometer or 4–20 mA signal
- **Precise electronic circuit in robust metal enclosure (sealed to IP65 / NEMA 4)**
- **Includes direct mounted standard solenoid valves outside positioner box for robustness and accessibility**

options

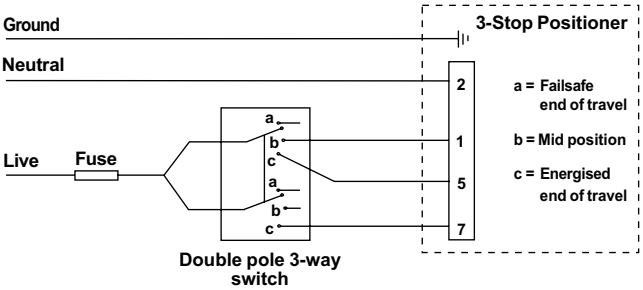
- **Limit switches (two mechanical or proximity sensors) inside same box**
- **4–20 mA mid position angle feedback circuit inside same box**
- **240 V ac, 115 V ac, 48 V dc and 24 V dc supply options**
- **Consult Kinetrol for the following options:**
  - spring return from mid position on electrical failure (fail action functions without air pressure)
  - 'hold' position on electrical (holds without need for air supply pressure)
  - double acting 'fail down' on electrical failure (requires air supply pressure)

typical wiring arrangement

Wiring Arrangement - Double Acting



Wiring Arrangement - Spring Return



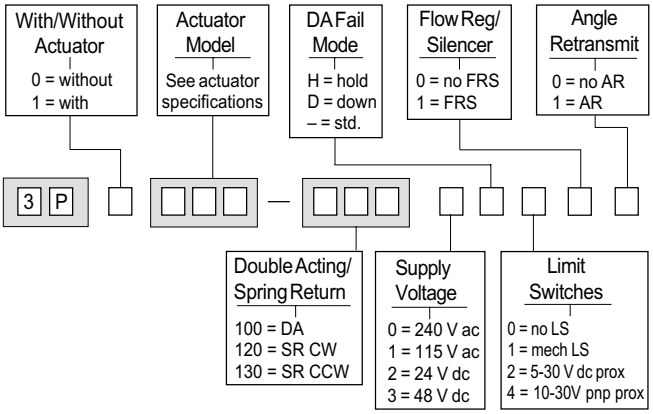
NOTE:- Double pole switch is necessary because terminals 5 and 7 must not be connected to each other when terminal 1 is Live (ie. when actuator is set to mid position).

INSTALLATION DIMENSIONS see page 36

specification

Supply voltages	230 V ac ±10%, 50 Hz 115 V ac ±10%, 50 or 60 Hz 24 V dc ±10% 48 V dc ± 10%
Power consumption	Positioner 1.5 W maximum Solenoids 20 VA inrush, 10VA hold
Working temperature range	0° to 70°C (32° to 160°F)
4–20 mA input resistance	250 ohms
External potentiometer resistance	2000 ohms to 20000 ohms
Linearity	<1% of range
Deadband	0.1% to 3% of range
Repeatability	<1% subject to optimisation of speed and deadband settings
Weight	2.4 kg/5.3 lb

ordering codes



Fail down clockwise is supplied as standard, if counter clockwise is required, please specify at order placement.

jumper/terminal configurations

Jumper shown thus:	Jumpers	Terminals
1 - On-board setpoint pot:	J3 J2 J1	Not connected
2 - User's external setpoint pot: (Minimum 2K Maximum 20K)	J3 J2 J1	9 10 11
3. User's external 4–20mA signal: (must be floating relative to power supply)	J3 J2 J1	9 10 11 – + NC

DA/SR Selection	
Double Acting	J3 J2 J1
Spring Return	J3 J2 J1

EL electropneumatic positioner

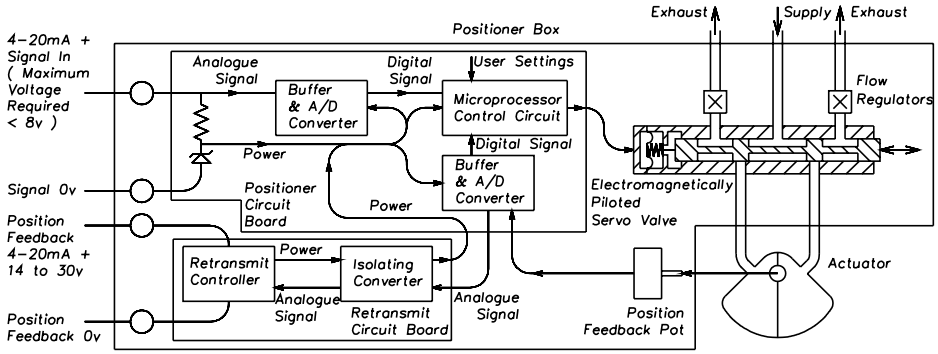
The EL positioner controls airflow to an actuator and moves it to a position determined by a 4-20mA signal. Its features are:

- **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 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 visual position indicator
  - DIN plug for external connection
- **Intrinsically safe approved options**
- **Weatherproof, compact and robust metal housing**
- **Vibration and shock resistant to 4G**
- **Built in gauge ports/ external connections**

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, which 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 push buttons via the positioner circuit push buttons.



Simplified Functional Diagram of EL Positioner

EL electropneumatic positioner - application

The EL positioner can be directly mounted on special versions of Kinetrol models 05, 07, 09, 10, 12 and 14 actuators, both double acting and spring return, giving an assembly with no external plumbing, wiring or mechanical connections and the best backlash free control. Mount kits are available for models 16, 18 and 20 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.

travel times

Direct mount from EL positioner to actuator (zero load)

Model	05	07	09	10	12	14
0-90°(sec)	0.7	1.1	2.8	4.1	6.0	12
Deg/sec	129	82	33	22	15	7.5

Externally piped from EL positioner to actuator (zero load)

Model	07	09	10	12	14	16	18	20
0-90°(sec)	1.0	2.4	3.2	5.0	10.5	22	45	90
Deg/sec	90	38	28	18	8.6	4.1	2	1

specification

Air Supply instrument quality (dry, clean, oil free) 3.5 to 7.0 bar, 50 to 100psi (Class 3.4.4 ISO 8573.1) . Contact Kinetrol for 5µm inlet air filter option

Signal 4-20mA, requiring max 8V to drive through positioner circuit (compatible with standard 24V dc source)

Control Response 0-90 degree 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 less than 0.7% of span*

Repeatability better than 0.7% of span*

Deviation from linearity less than 0.7% of span*

Operating temperature –20°C to +70°C (–4°F to 160°F)

Flowrate 3.3 scfm / 93 l/min @ 5.5 barg

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 valve and liner - stainless steel

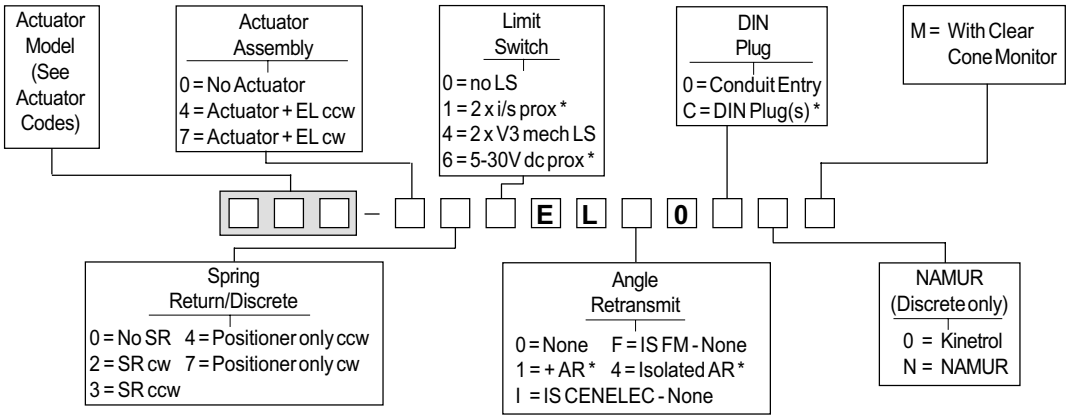
Finish epoxy stove enamel

Enclosure IP65 / NEMA 4X

Ratings

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

ordering codes



Examples:

050-404EL0000M
= ccw EL on 050 actuator + LS + Clear Cone Monitor

000-040EL000N
= discrete ccw EL with NAMUR drive

* unavailable on IS version.

INSTALLATION DIMENSIONS see page 38

180 degree pneumatic rotary actuator

- **Simple compact unit**
  No external moving parts.
- **Unique linkage design**
  Converts to 180° travel.
- **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 maintainance free life.
- **Compatible with all Kinetrol modules**
  Direct mounted spring returns, limit switch boxes, positioners etc.
- **Adjustable endstops**
  Giving up to 200° travel.

operation

KINETROL's 180 degree actuator is produced by adding a 2:1 step-up linkage onto the output shaft of well proven 90 degree 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 may be 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 zinc alloy casing. Exterior surfaces are protected by a corrosion resistant epoxy stove enamel 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 control accessories to be fitted directly.

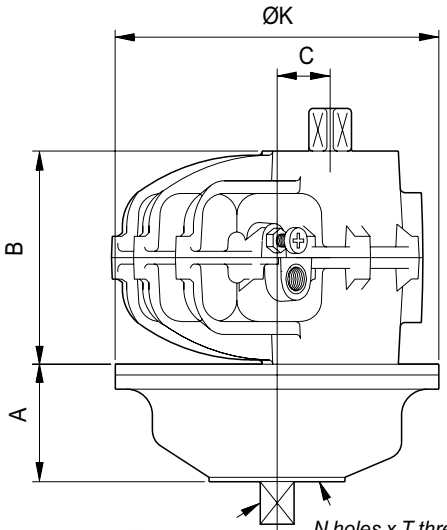
120 degree actuators are also available for the above model range.

ordering codes

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

Example:
To order an 070 cw spring return actuator with limit switch box plus 180° linkage, use code: 070-1241.

180 degree assembly dimensions & torques



☒ G x S long
Output square is shown at limit of travel (orientation is offset 45° to actuator shaft)

N holes x T thread x D deep x PCD Mounting holes are aligned with actuator interface

metric units

actuator model	A mm	B mm	C mm	K mm	G mm	S mm	N	T ISO	D mm	PCD mm	Wt kg
02	32	50	12.5	73	8.0	10.0	4	M4	8.0	25.5	1.10
03	36	60	20	108	9.0	12.0	4	M5	10.0	31.1	2.00
05	35	67	20	108	9.5	13.0	6	M5	8.0	34.9	2.50
07	59	100	25	152	16.0	20.0	4	M8	16.0	50.9	5.90
09	70	126	35	200	19.0	26.0	4	M10	20.0	65.0	13.20
12	99	156	45	258	25.0	31.0	4	M12	22.0	77.8	25.45
14	122	200	70	394	28.6	38.0	4	M16	28.5	98.8	51.00
16	176	274	100	520	41.0	55.0	4	M24	32.0	152.7	125.00

english units

actuator model	A inch	B inch	C inch	K inch	G inch	S inch	N	T UNF	D inch	PCD inch	Wt lbs
02	1.24	1.97	0.49	2.87	0.315	0.39	4	8-36	0.31	1.000	2.43
03	1.40	2.36	0.79	4.25	0.354	0.47	4	10-32	0.39	1.225	4.41
05	1.38	2.64	0.79	4.25	0.375	0.51	6	10-32	0.31	1.375	5.51
07	2.32	3.94	0.98	6.00	0.630	0.79	4	5/16-24	0.63	2.000	13.01
09	2.76	4.96	1.38	7.90	0.748	1.02	4	3/8-24	0.79	2.560	29.10
12	3.90	6.14	1.77	10.16	0.984	1.22	4	1/2-20	0.87	3.060	56.11
14	4.79	7.87	2.76	15.50	1.125	1.50	4	5/8-18	1.13	3.890	112.43
16	6.93	10.79	3.94	20.47	1.61	2.17	4	7/8-14	1.26	6.012	275.00

N.B. Weights are inclusive of actuator and 180 degree assembly

double acting torques/metric units Nm

actuator model	1.4	2.0	2.8	3.5	4.1	4.8	5.5	6.2	6.9
	pressure (bar)								
02-1001	0.6	1.1	1.6	2.2	2.7	3.2	3.7	4.2	4.8
03-1001	1.3	2.4	3.5	4.6	5.6	6.7	7.8	8.8	10.0
05-1001	3.2	5.2	7.2	9.3	11.3	13.6	15.6	17.8	19.9
07-1001	7.9	12.6	17.6	22.6	27.6	33.0	38.4	43.2	48.8
09-1001	16.3	20.0	37.1	47.6	58.0	69.2	80.4	91.2	103.0
12-1001	37.5	60.8	84.4	108.0	131.0	156.0	180.0	202.0	226.0
14-1001	97.2	151.0	206.0	262.0	316.0	375.0	434.0	488.0	542.0
16-1001	235.0	357.0	479.1	605.7	727.7	849.8	976.3	1098.4	1220.4

double acting torques/english units lbf/ins

actuator model	20	30	40	50	60	70	80	90	100
	pressure (psi)								
02-1001	5.6	10	14	19	24	28	33	37	42
03-1001	12	21	31	40	50	59	69	78	88
05-1001	28	46	64	82	100	120	138	157	176
07-1001	70	112	156	200	244	292	340	384	432
09-1001	144	236	328	420	512	612	712	808	912
12-1001	332	540	748	960	1160	1376	1588	1792	2000
14-1001	860	1340	1820	2320	2800	3320	3840	4320	4800
16-1001	2080	3160	4240	5360	6440	7520	8640	9720	10800

spring return torques/metric units Nm

actuator model	position of air OR spring stroke	3.5	4.0	4.5	5.0	5.5
		pressure setting (bar)				
02-1201	Start	1.1	1.3	1.4	1.6	1.8
	Finish	0.5	0.7	0.9	1.2	1.4
03-1201	Start	3.3	3.7	4.0	4.3	4.9
	Finish	1.0	1.5	1.9	2.2	2.8
05-1201	Start	4.9	5.5	6.2	7.0	7.9
	Finish	3.2	4.0	4.9	5.8	6.7
07-1201	Start	11.6	13.5	15.5	17.4	19.3
	Finish	7.5	9.5	11.6	13.8	16.1
09-1201	Start	23.2	27.4	31.1	35.3	39.5
	Finish	19.1	23.2	27.0	31.4	35.6
12-1201	Start	55.1	64.8	75.6	81.1	90.4
	Finish	42.2	52.0	60.0	68.9	77.5
14-1201-4900	Start	135.0	156.0	178.0	195.0	201.0
	Finish	109.0	131.0	148.0	164.0	170.0
16-1201	Start	346.8	391.0	426.0	465.0	504.3
	Finish	181.4	237.0	282.0	332.0	381.9

spring return torques/english units lbf/ins

actuator model	position of air OR spring stroke	50	60	70	80
		pressure setting (psi)			
02-1201	Start	10.3	12.2	14.1	16.0
	Finish	4.6	6.8	9.5	12.5
03-1201	Start	29.6	33.4	37.2	43.7
	Finish	8.7	13.7	19.0	24.7
05-1201	Start	44	51	61	70
	Finish	28	38	49	59
07-1201	Start	103	126	146	171
	Finish	67	92	116	143
09-1201	Start	205	251	300	351
	Finish	169	215	266	315
12-1201	Start	486	595	693	802
	Finish	374	479	585	688
14-1201-4900	Start	1200	1420	1670	1780
	Finish	969	1200	1400	1500
16-1201	Start	3069	3534	3998	4463
	Finish	1605	2197	2788	3380

manual fail-safe spring units

If you want to operate a valve manually, but maintain the advantage of the failsafe 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**
- **Fire fail-safe option**
  for fail-safe manual operation of valves etc.
- **Clockwise or counter clockwise 90° spring action**
  (02 version reversible without the need for spring removal)
- **Weatherproof sealed spring housing to protect from internal corrosion**

application

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

Models 05, 09 and 12 fire fail-safe units (maximum torque to 260Nm/2300lbf.ins) are available. Contact Kinetrol for details.

ISO/DIN versions

The 03 & 05 single and double versions are available with female ISO/DIN drive. 03 versions are available with F03, F05 and F04 flanges whilst 05 versions are available with F03, F05, F07 and F04 flanges.

To order din flange units use code 031 or 051 at the start of the product code, and for F04 versions add F04 to the end of the order code.

specification

Spring case	Die cast zinc alloy with epoxy paint finish
Shaft	Stainless steel
Lever	Stainless steel (03 & 05), aluminium (02)
Optional fusible link	Soldered type (or eqivalent) 2 options

Yield temperature °C	72	93
Max normal ambient temperature °C	42	63

ordering codes

To order a manual or fire fail-safe spring unit, quote model number, direction of spring (as per technical data page 4) followed by product code.

Type codes:
- 1006 - single spring unit
- 1007 - double spring unit
- 1201 - single spring fire fail-safe unit
- 1203 - double spring fire fail-safe unit

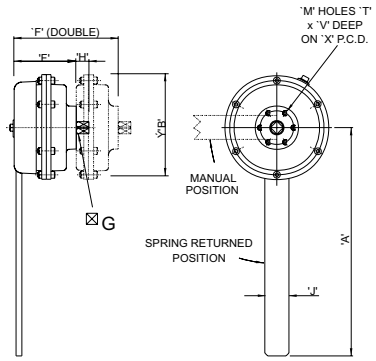
When ordering fire fail-safe units, please state maximum torque required (at or below maximum shown in table) and if appropriate fusible link yield.

Example: for an 05 model, ISO threads, single spring clockwise, 15Nm maximum torque, 72° fusible link, the code would be:

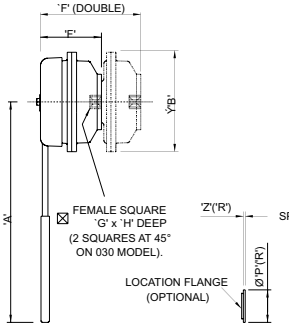
050-020-1201-15Nm-72°C

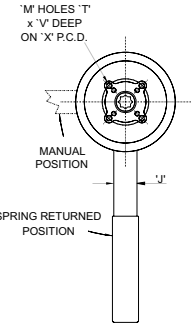
manual fail-safe spring units

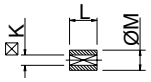
03 AND 05 MODELS:



ISO/DIN MOUNT

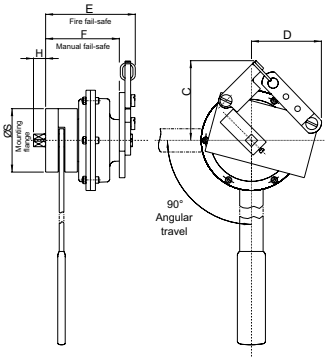




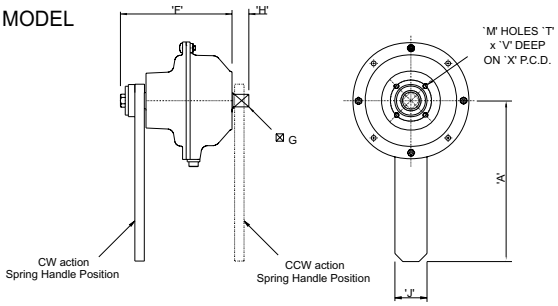


STANDARD COUPLING SUPPLIED WITH MALE SQUARE UNITS

FIRE FAIL-SAFE UNIT
Shown in energised position



02 MODEL



dimensions/torques

metric units

MODEL No.	No of springs	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	J mm	K mm	L mm	M mm	N	P mm	R	S mm	T	V mm	X mm	Z mm	Maximum Torque Nm	Torque Reduction Thro' Stroke Nm
020-020-1006	1	110.0	73.0	-	-	-	60.0	7.98 7.93	10.0	25	8.022 8.000	20.0	16.0	4	-	-	34.0	M4	8.0	25.5	-	5.1	1.0
030-020-1006	1	237.5	108.0	-	-	-	62.0	8.98 8.93	12.0	25	9.022 9.000	22.0	18.0	4	-	-	45.0	M5	10.0	31.1	-	14.0	3.0
031-020-1006	1	238.0	108.0	-	-	-	66.0	11.0	12.0	25	-	-	-	4	25/35	F03/5	-	M5/M6	10/12	36.0/50.0	1.4/2.0	-	-
031-020-1006/F4	1	238.0	108.0	-	-	-	66.0	11.0	12.0	25	-	-	-	4	30	F04	-	M5	10.0	42.0	2.0	-	-
050-020-1006	1	237.5	108.0	-	-	-	62.0	9.525 9.470	13.0	25	9.58 9.55	25.4	19.0	6	-	-	45.0	M5	8.0	34.9	-	24.0	3.5
050-020-1007	2	237.5	108.0	-	-	-	106.0	9.525 9.470	13.0	25	9.58 9.55	25.4	19.0	6	-	-	45.0	M5	8.0	34.9	-	45.5	5.8
050-020-1201	1	237.5	108.0	85.0	75.0	97.0	79.0	9.525 9.470	13.0	25	9.58 9.55	25.4	19.0	6	-	-	68.0	M5	13.0	34.9	-	24.0	3.5
050-020-1203	2	237.5	108.0	85.0	75.0	142.0	124.0	9.525 9.470	13.0	25	9.58 9.55	25.4	19.0	6	-	-	68.0	M5	13.0	34.9	-	45.5	5.8
051-020-1006	1	238.0	118.0	-	-	-	69.0	14.0	16.0	25	-	-	-	4	25/35/55	F03/5/7	-	M5/M6/M8	10/12/13	36.0/50.0/70.0	1.4/2.0	-	-
051-020-1006/F4	1	238.0	118.0	-	-	-	69.0	14.0	16.0	25	-	-	-	4	30	F04	-	M5	10.0	42.0	2.0	-	-
051-020-1007	2	358.0	118.0	-	-	-	119.0	14.0	16.0	25	-	-	-	4	25/35/55	F03/5/7	-	M5/M6/M8	10/12/13	36.0/50.0/70.0	1.4/2.0	-	-
051-020-1007/F4	2	358.0	118.0	-	-	-	119.0	14.0	16.0	25	-	-	-	4	30	F04	-	M5	10.0	42.0	2.0	-	-

english units

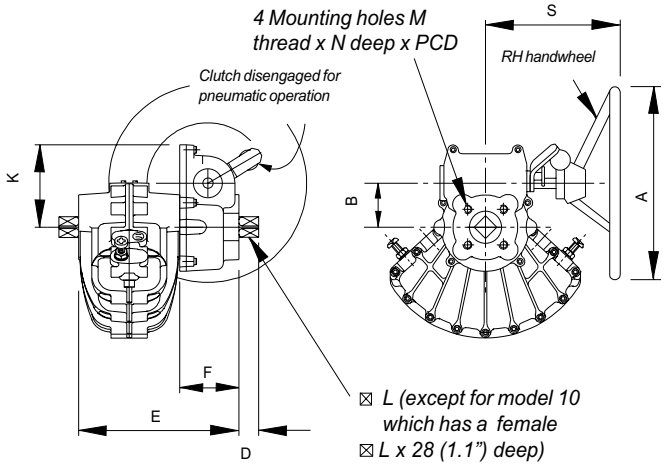
MODEL No.	No of springs	A inch	B inch	C inch	D inch	E inch	F inch	G inch	H inch	J inch	K inch	L inch	M inch	N	P inch	R	S inch	T UNF	V inch	X inch	Z inch	Maximum Torque lbf.ins	Torque Reduction Thro' Stroke lbf.ins
029-020-1006	1	4.33	2.87	-	-	-	2.36	0.314 0.312	0.39	0.98	0.316 0.315	0.79	0.63	4	-	-	1.34	8-36	0.31	1.0	-	45.0	9.0
039-020-1006	1	9.35	4.25	-	-	-	2.44	0.354 0.352	0.47	0.98	0.355 0.354	0.87	0.71	4	-	-	1.77	10-32	0.39	1.224	-	123.0	26.0
059-020-1006	1	9.35	4.25	-	-	-	2.36	0.375 0.373	0.51	0.98	0.377 0.376	1.0	0.75	6	-	-	1.77	10-32	0.31	1.375	-	210.0	31.0
059-020-1007	2	9.35	4.25	-	-	-	4.17	0.375 0.373	0.51	0.98	0.377 0.376	1.0	0.75	6	-	-	1.77	10-32	0.31	1.375	-	400.0	51.0
059-020-1201	1	9.35	4.25	3.45	2.95	3.82	3.11	0.375 0.373	0.51	0.98	0.377 0.376	1.0	0.75	6	-	-	2.68	10-32	0.5	1.375	-	210.0	31.0
059-020-1203	2	9.35	4.25	3.45	2.95	5.59	4.88	0.375 0.373	0.51	0.98	0.377 0.376	1.0	0.75	6	-	-	2.68	10-32	0.5	1.375	-	400.0	51.0

Spring return units counter clockwise are the same as above.

geared manual overrides

Kinetrol declutchable geared overrides are available for models 05, 07, 09, 10, 12, 14 and 16, rated for the same torques as the actuators and fitted between the actuator and the load. The standard unit is supplied with the right hand handwheel option (see drawing below), whereby when the handwheel is moved in a clockwise direction the actuator moves in a counter clockwise direction. A left hand handwheel option is also available.

dimensions



N.B. Drawing is not representative of model 16 Gearbox. For full details contact Kinetrol

ordering codes

Models 05 to 16:
(standard right hand handwheel)

Example for an 07 model:

070 K/BOX (ISO version)
079 K/BOX (ANSI version)

Models 05 to 16:
(left hand handwheel)

Example for an 07 model:

070 K/BOX LH (ISO version)
079 K/BOX LH (ANSI version)

metric units

actuator model (ISO)	A mm	B mm	D mm	E mm	F mm	K mm	☒L mm	M	N mm	PCD mm	S mm	Wt kgs
05	300	67.8	13	170	103	127	9.5	M5	12	34.9	208	9.18
07	300	67.8	20	192	92	127	16.0	M8	16	50.9	208	11.20
09	300	67.8	26	218	92	127	19.0	M10	20	65.0	208	14.44
10	300	67.8		267	92	127	22.0	M10	20	102.0	208	17.50
12	300	67.8	31	248	92	127	25.0	M12	25	77.8	208	20.40
14	615	67.8	38	292	92	127	28.6	M16	28	98.8	270	32.06
16	610	132.0	55	448	174	194	41.0	M16	28	200.0	276	69.80

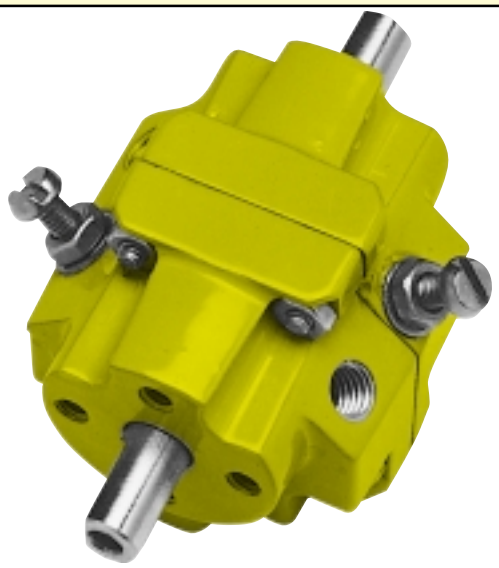
english units

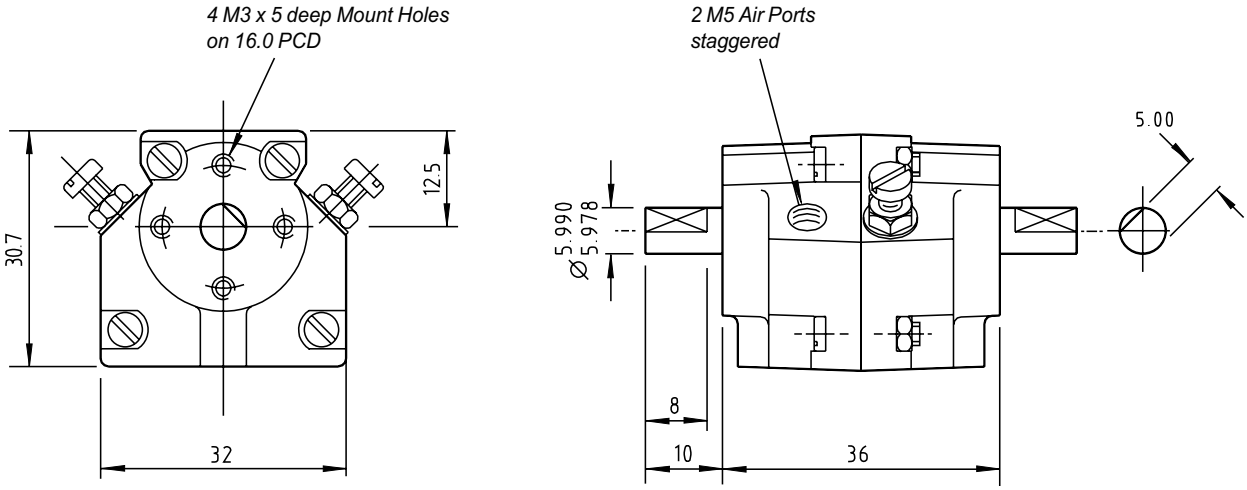
actuator model (ANSI)	A inch	B inch	D inch	E inch	F inch	K inch	☒L inch	M UNF	N inch	PCD inch	S inch	Wt lbs
05	11.81	2.67	0.51	6.69	4.06	5.0	0.375	10-32	0.47	1.375	8.19	20.2
07	11.81	2.67	0.79	7.56	3.62	5.0	0.630	5/16-24	0.63	2.000	8.19	24.7
09	11.81	2.67	1.02	8.58	3.62	5.0	0.748	3/8-24	0.79	2.560	8.19	31.8
10	11.81	2.67		10.51	3.62	5.0	0.866	3/8-24	0.79	4.016	8.19	38.5
12	11.81	2.67	1.22	9.76	3.62	5.0	0.984	1/2-20	0.98	3.060	8.19	44.9
14	24.20	2.67	1.50	11.50	3.62	5.0	1.125	5/8-18	1.10	3.890	10.63	70.5
16	24.00	5.20	2.17	17.64	6.85	7.64	1.614	M16	1.10	7.874	10.87	154.0

model omo (miniature)

Output torque	8.0 lbf.ins/0.9 Nm at 100 psi/7 bar
Angle of travel (adjustable)	80° – 100° (restricted travel versions available to order)
Displaced volume	0.15 in^3/2.4 cm^3
Finish	Epoxy stove enamel
Weight	0.26 lb/0.12 kg

For further information see General Specification, page 41.





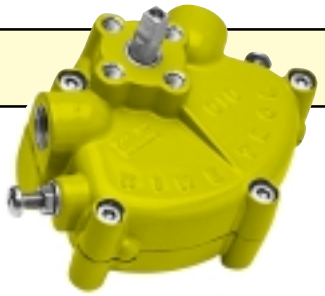
Actual Size

options

- Code identification see page 32
- Torque outputs see pages 39/40

ENGLISH DIMENSIONS see page 34

model 01

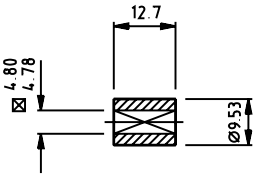


010-100A

010-100

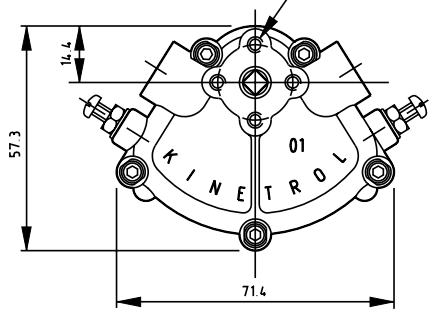
Output torque	58 lbf.ins/6.7 Nm at 100 psi/7 bar
Angle of travel	See below (restricted travel versions available to order)
Displaced volume	0.91 in^3/15 cm^3
Finish	Epoxy stove enamel
Weight	See below

For further information see General Specification, page 41.

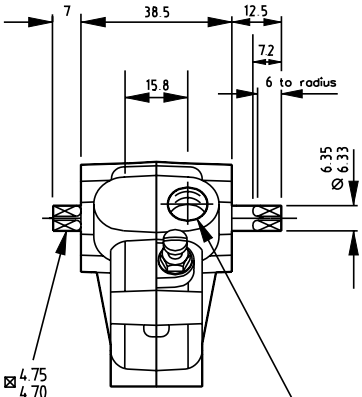


STANDARD COUPLING
(supplied with both actuators
weight 0.22 lbs/0.1kg)

4 Mount Holes
each side details below ○



Actuator 010-100A
Angle of travel 78° - 100°
Weight 0.33 lb/0.15 kg

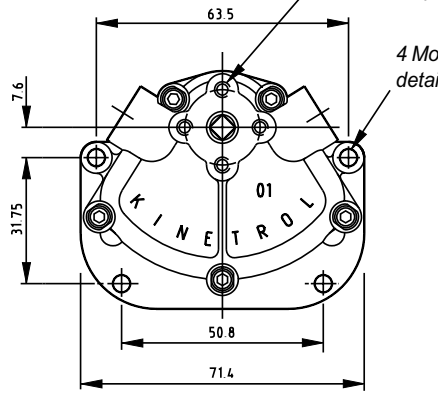


Shown at limit of travel

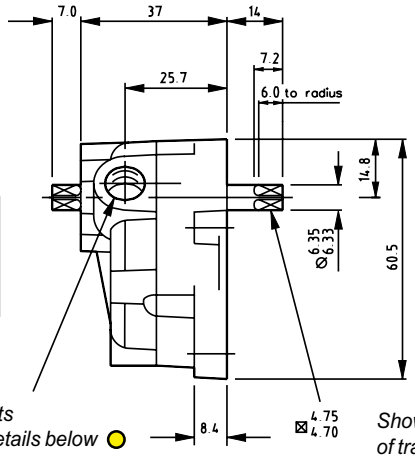
2 Air Ports staggered thread details below ○

4 Aux. Mount Holes
M4 x 6 deep on 19.0 PCD

4 Mount Holes
details below ○



Actuator 010-100
Angle of travel 90°
Weight 0.40 lb/0.18 kg



2 Air Ports
thread details below ○

Shown at limit of travel

options

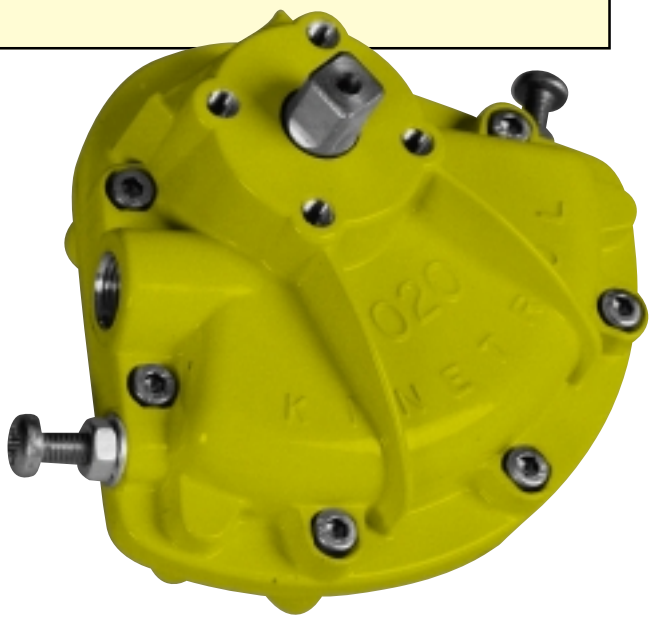
- ☐ Fail safe spring return units - clockwise or counter clockwise
- ☐ Code identification see page 32
- ☐ Torque outputs see pages 39/40
- ☐ Size details of options see page 35

○ **Air Ports/Mount Holes**

Model	Air Ports	Mount Holes
010-100A	G1/8"	M4 x 6 deep x 19.0 PCD
019-100A	1/8" NPT	8-36 UNF x 15/64" deep x 0.75" PCD
010-100	G1/8"	M4 clearance

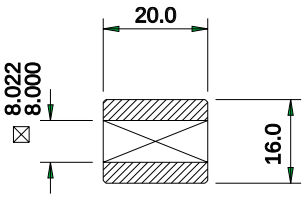
ENGLISH DIMENSIONS see page 34

model 02

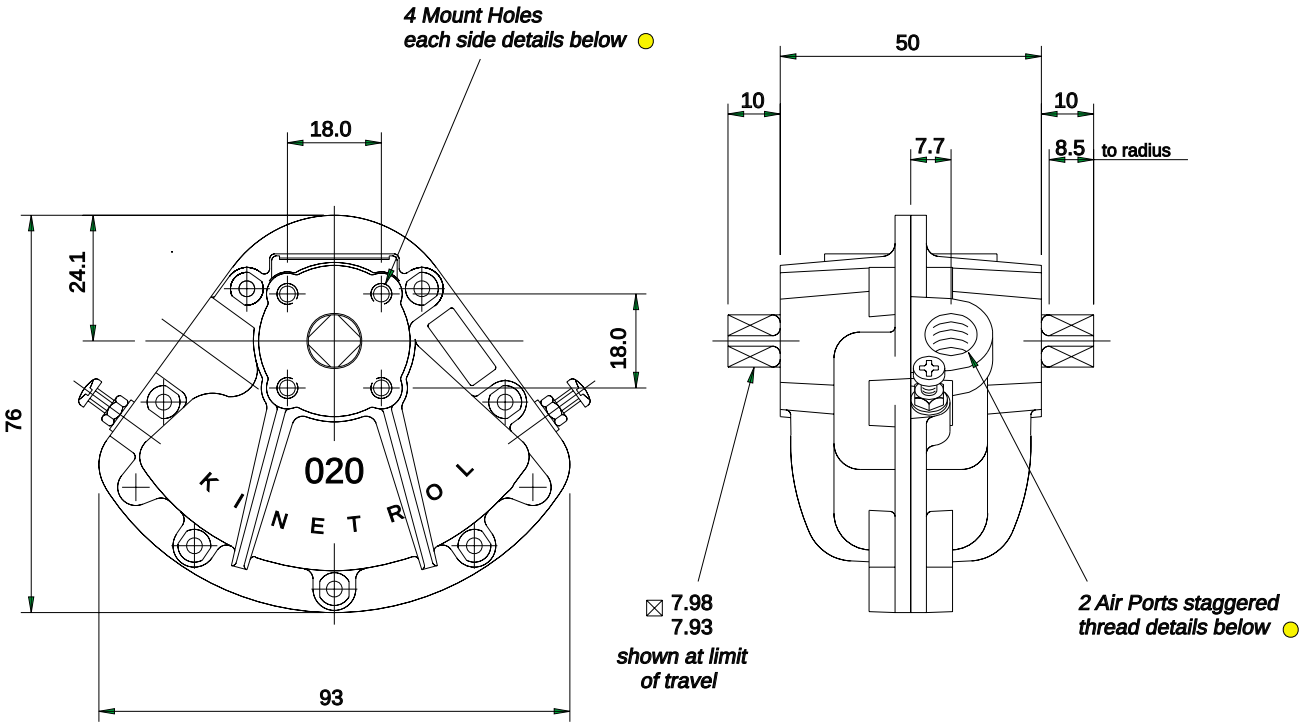


Output torque	105 lbf.ins/12.1 Nm at 100 psi/7 bar
Angle of travel (adjustable)	80° – 96° (restricted travel versions available to order)
Displaced volume	1.89 in^3/31 cm^3
Finish	Epoxy stove enamel
Weight	0.93 lb/0.42 kg (excluding coupling)

For further information see General Specification, page 41.



STANDARD COUPLING (supplied with actuator weight 0.04 lbs/0.02kg)



options

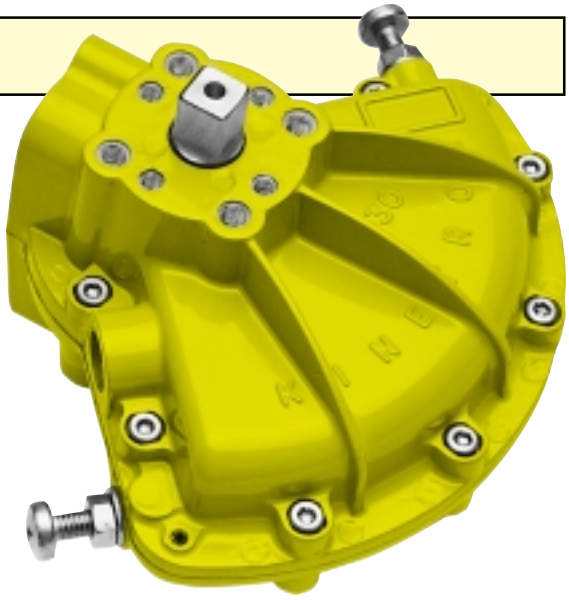
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- 180° model
- Female drive and mounting details to DIN 3337 and ISO 5211
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 14/35/36

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
020-100	G1/8"	M4 x 8 deep x 25.5 PCD
028-100	G1/8"	M4 x 8 deep x 25.5 PCD
029-100	1/8" NPT	8-36 UNF x 5/16" deep on 1.00" PCD

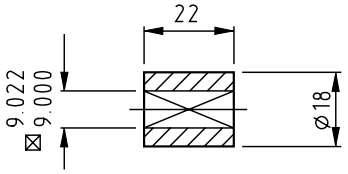
ENGLISH DIMENSIONS see page 34

model 03

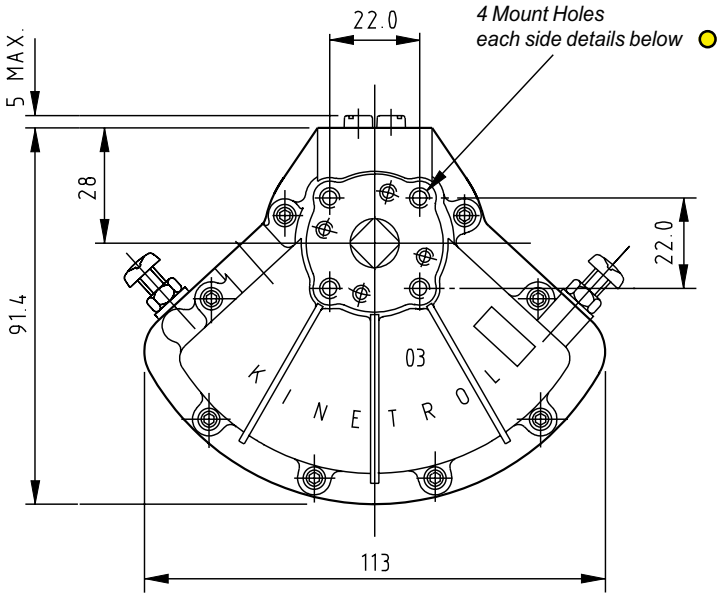


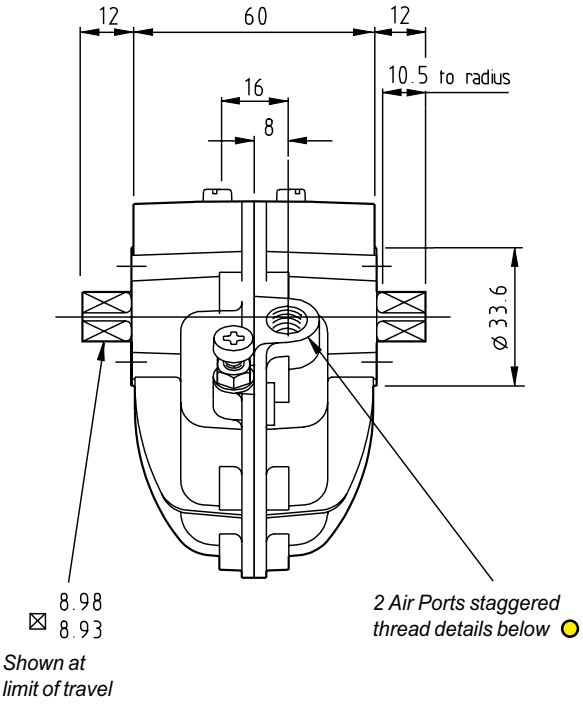
Output torque	220 lbf.ins/25 Nm at 100 psi/7 bar
Angle of travel	80° - 100° (restricted travel versions available to order)
Displaced volume	3.66 in^3/60 cm^3
Finish	Epoxy stove enamel
Weight	1.53 lb/0.70 kg (excluding coupling)

For further information see General Specification, page 41.



STANDARD COUPLING
(supplied with actuator
weight 0.07lbs/0.03kg)





options

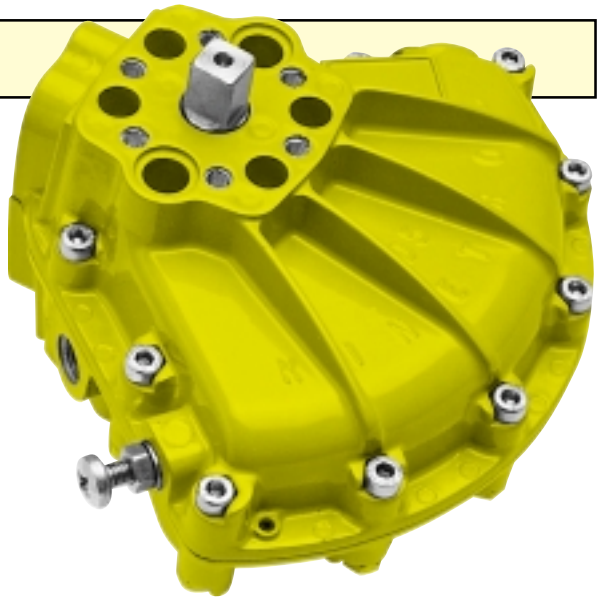
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- Integral solenoid valve
- 180° model
- Female drive and mounting details to DIN 3337 and ISO 5211
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 6/14/35/36/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
030-100	G1/8"	M5 x 10 deep x 31.1 PCD
038-100	G1/8"	M5 x 10 deep x 31.1 PCD
039-100	1/8" NPT	10-32 UNF x 3/8" deep on 1.23" PCD

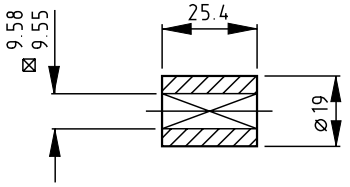
ENGLISH DIMENSIONS see page 34

model 05

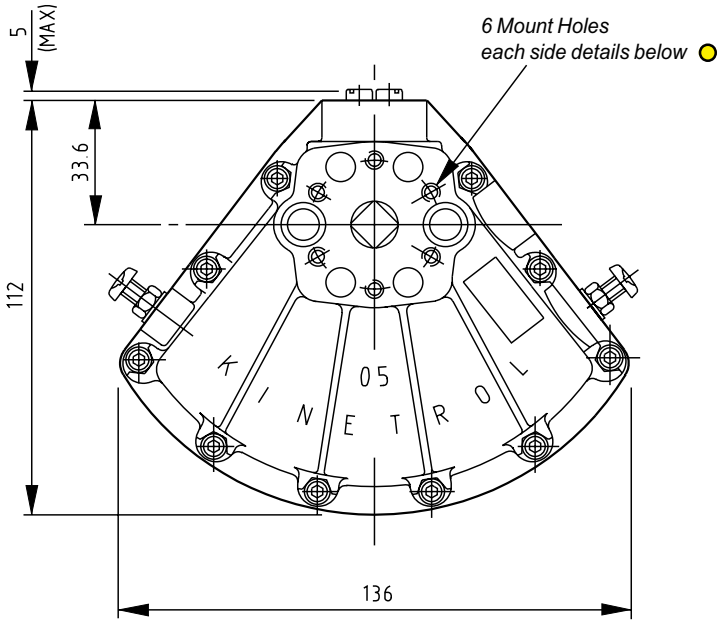


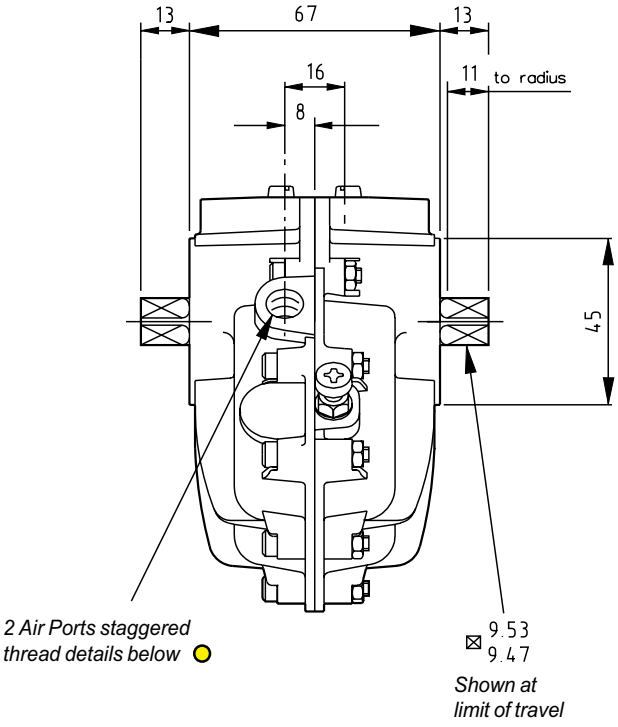
Output torque	440 lbf.ins/50 Nm at 100 psi/7 bar
Angle of travel (adjustable)	84° – 100° (restricted travel versions available to order)
Displaced volume	6.9 in^3/113 cm^3
Finish	Epoxy stove enamel
Weight	2.73 lb/1.24 kg (excluding coupling)

For further information see General Specification, page 41.



STANDARD COUPLING (supplied with actuator weight 0.09lbs /0.04kg)





options

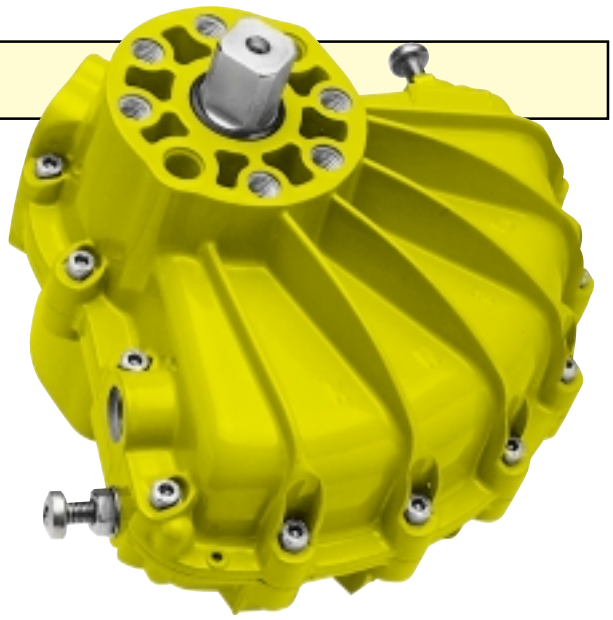
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- Integral solenoid valve
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner- full range of options see pages 11 & 12
- 3 stop positioner
- 180° model
- Clear cone position monitor
- Female drive and mounting details to DIN 3337 and ISO 5211
- Geared manual override
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 6/14/17/35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
050-100	G1/8"	M5 x 10 deep x 34.9 PCD
058-100	G1/8"	M5 x 10 deep x 34.9 PCD
059-100	1/8" NPT	10-32 UNF x 3/8" deep on 1.375" PCD

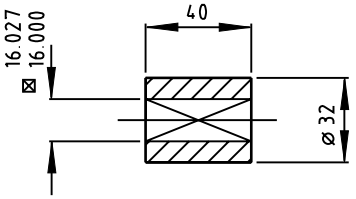
ENGLISH DIMENSIONS see page 34

model 07

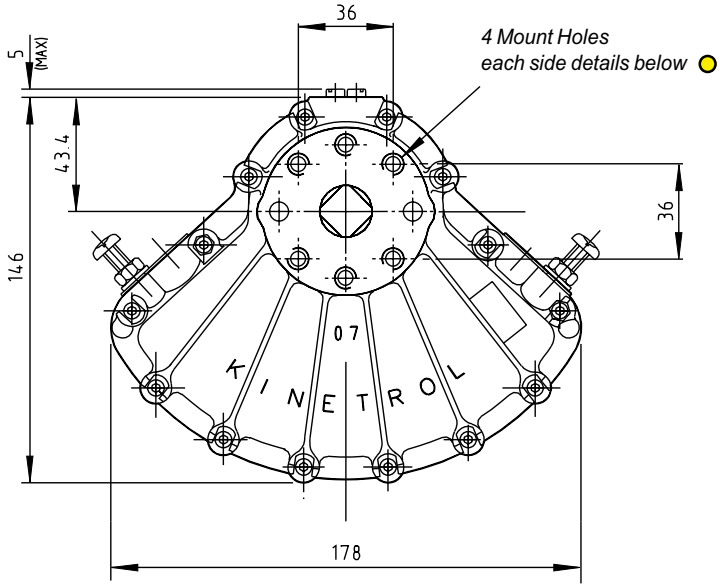


Output torque	1080 lbf.ins/124 Nm at 100 psi/7 bar
Angle of travel	80° - 100° (restricted travel versions available to order)
Displaced volume	18.3 in^3/300 cm^3
Finish	Epoxy stove enamel
Weight	6.91 lb/3.13 kg (excluding coupling)

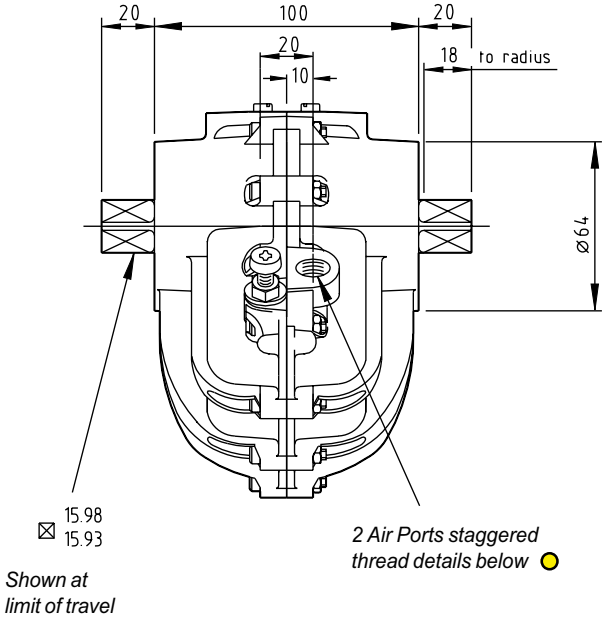
For further information see General Specification, page 41.



STANDARD COUPLING (supplied with actuator weight 0.37lbs/0.17kg)



4 Mount Holes each side details below ○



Shown at limit of travel

2 Air Ports staggered thread details below ○

options

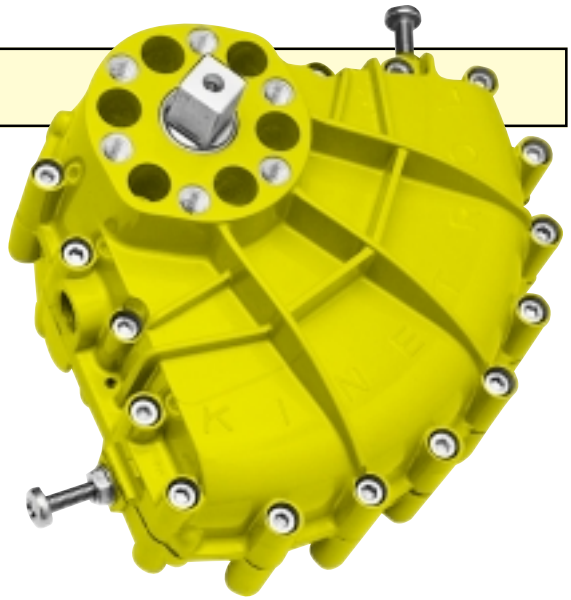
- ☐ Fail safe spring return units - clockwise or counter clockwise
- ☐ Limit switch boxes for open/close indication - various switches for all hazardous areas
- ☐ Integral solenoid valve
- ☐ AP pneumatic positioner - full range of options see pages 7 & 8
- ☐ EL electropneumatic positioner - full range of options see pages 11 & 12
- ☐ 3 stop positioner
- ☐ 180° model
- ☐ Clear cone position monitor
- ☐ Female drive and mounting details to DIN 3337 and ISO 5211
- ☐ Geared manual override
- ☐ Code identification see page 32
- ☐ Torque outputs see pages 39/40
- ☐ Size details of options see pages 6/14/17/35/36/37/38

○ **Air Ports/Mount Holes**

Model	Air Ports	Mount Holes
070-100	G1/4"	M8 x 16 deep x 50.9 PCD
078-100	G1/4"	M8 x 16 deep x 50.9 PCD
079-100	1/4" NPT	5/16"-24 UNF x 5/8" deep on 2.00" PCD

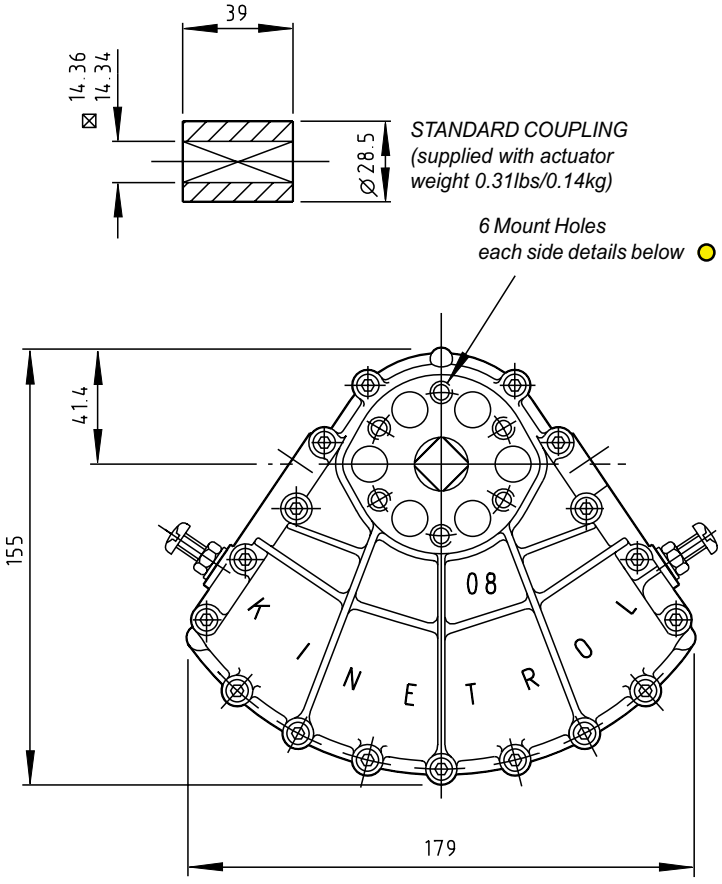
ENGLISH DIMENSIONS see page 34

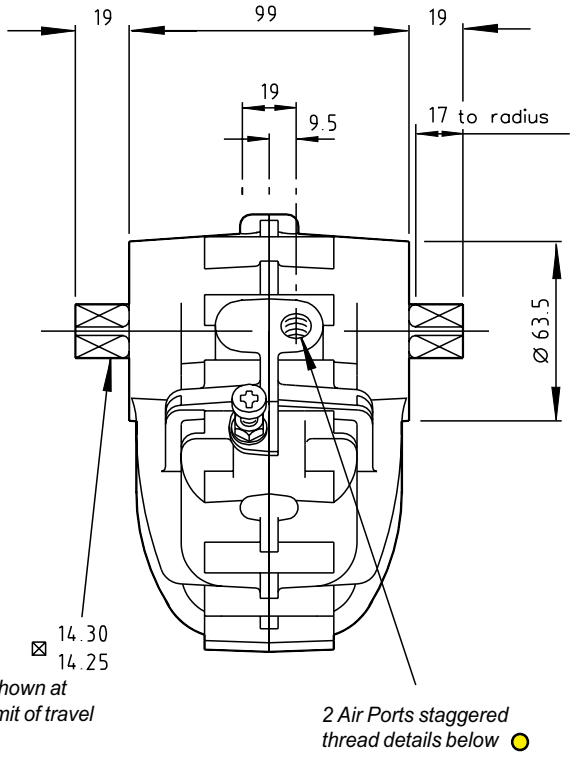
model 08



Output torque	1500 lbf.ins/173 Nm at 100 psi/7 bar
Angle of travel (adjustable)	72° – 93° (restricted travel versions available to order)
Displaced volume	23.9 in³/392 cm³
Finish	Epoxy stove enamel
Weight	6.85 lb/3.11 kg (excluding coupling)

For further information see General Specification, page 41.





options

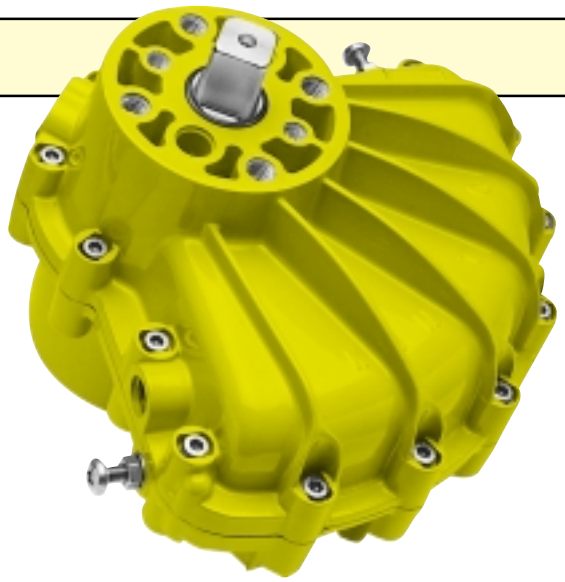
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- AP pneumatic positioner - full range of option see pages 7/8
- EL electropneumatic positioner - full range of options see pages 11/12
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
080-100	G¼"	M8 x 16 deep x 50.8 PCD
088-100	G¼"	M8 x 16 deep x 50.8 PCD
089-100	¼" NPT	5/16-24 UNF x 5/8" deep on 2.00" PCD

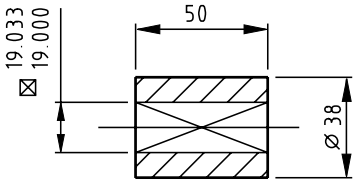
ENGLISH DIMENSIONS see page 34

model 09

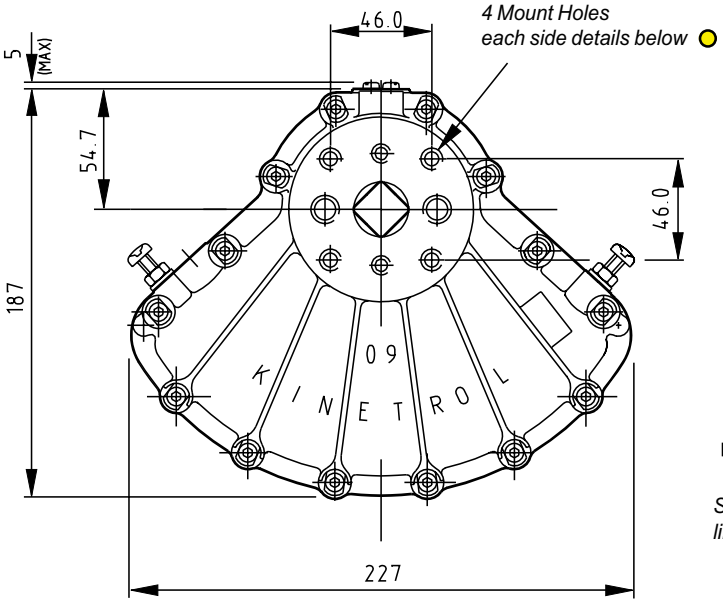


Output torque	2280 lbf.ins/261 Nm at 100 psi/7 bar
Angle of travel	80° - 100° (restricted travel versions available to order)
Displaced volume	39.3 in^3/644 cm^3
Finish	Epoxy stove enamel
Weight	13.82 lb/6.24 kg (excluding coupling)

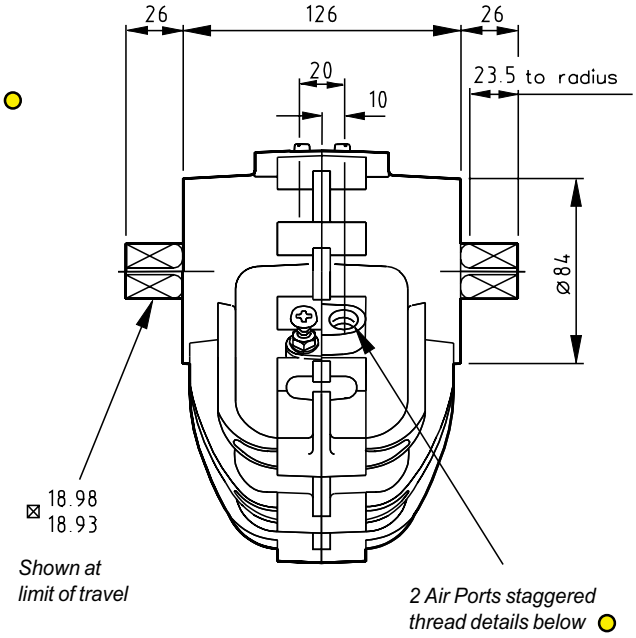
For further information see General Specification, page 41.



STANDARD COUPLING (supplied with actuator weight 0.6lbs/0.3kg)



4 Mount Holes each side details below



Shown at limit of travel

2 Air Ports staggered thread details below

options

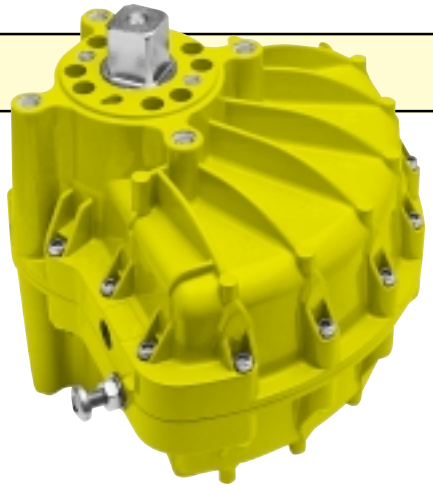
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- Integral solenoid valve
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner - full range of options see pages 11 & 12
- 3 stop positioner
- 180° model
- Geared manual override
- Clear cone position monitor
- Female drive and mounting details to DIN 3337 and ISO 5211
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 6/14/17/35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
090-100	G1/4"	M10 x 20 deep x 65.0 PCD
098-100	G1/4"	M10 x 20 deep x 65.0 PCD
099-100	1/4" NPT	3/8"-24 UNF x 25/32" deep on 2.56" PCD

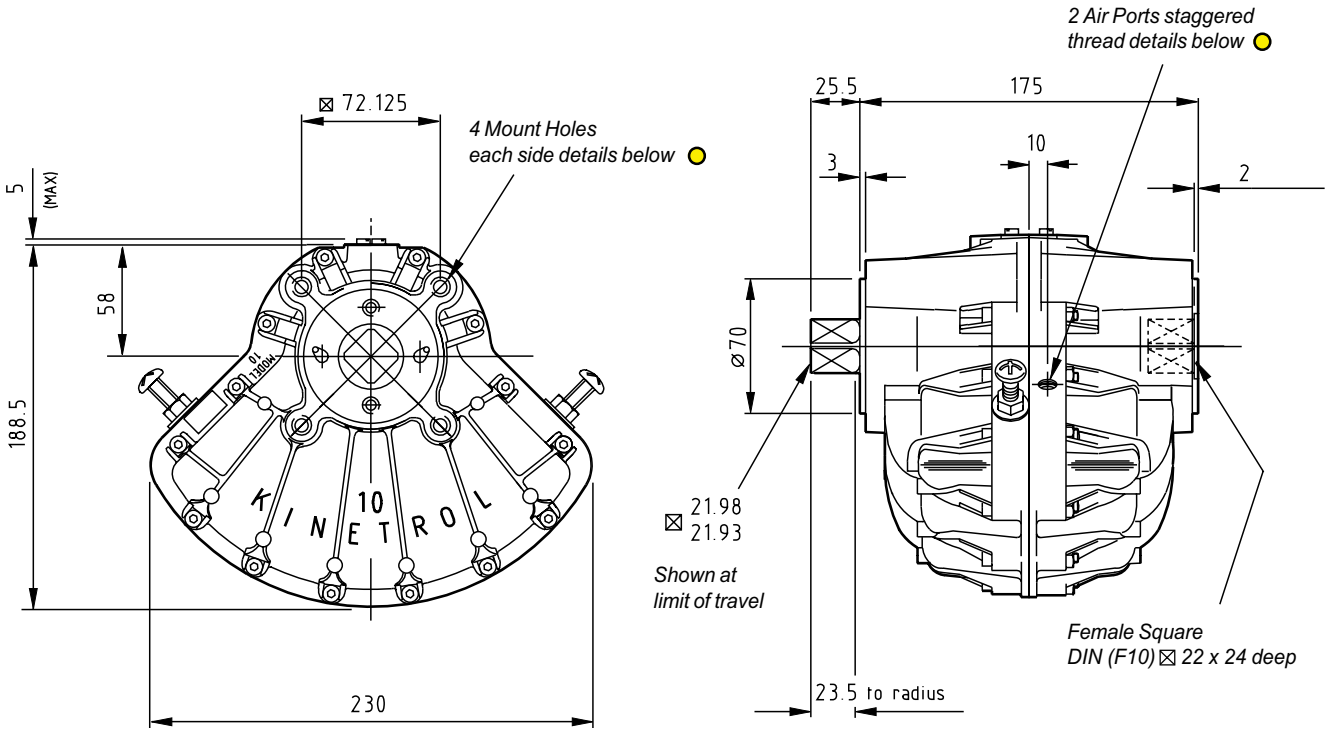
ENGLISH DIMENSIONS see page 34

model 10



Output torque	3625 lbf.ins/416 Nm at 100 psi/7 bar
Angle of travel (adjustable)	78° – 100° (restricted travel versions available to order)
Displaced volume	62.5 in^3/1025 cm^3
Finish	Epoxy stove enamel
Weight	21.2 lb/9.6 kg (including coupling)

For further information see General Specification, page 41.



Female drive and mounting details to DIN 3337 and ISO5211 as standard

options

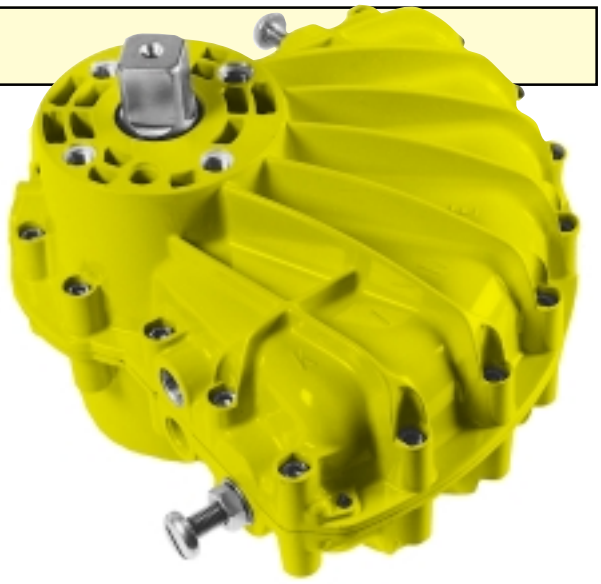
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- Integral solenoid valve
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner - full range of options see pages 11 & 12
- 3 stop positioner
- Geared manual override
- Clear cone position monitor
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 6/17/35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
101-100	G1/4"	M10 x 16 deep x 102.0 PCD
108-100	G1/4"	M10 x 16 deep x 102.0 PCD
109-100	1/4" NPT	3/8-24 UNF x 5/8" deep on 4.02" PCD

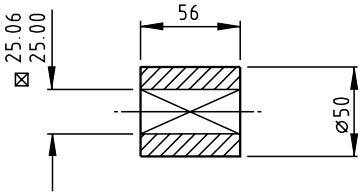
ENGLISH DIMENSIONS see page 34

model 12

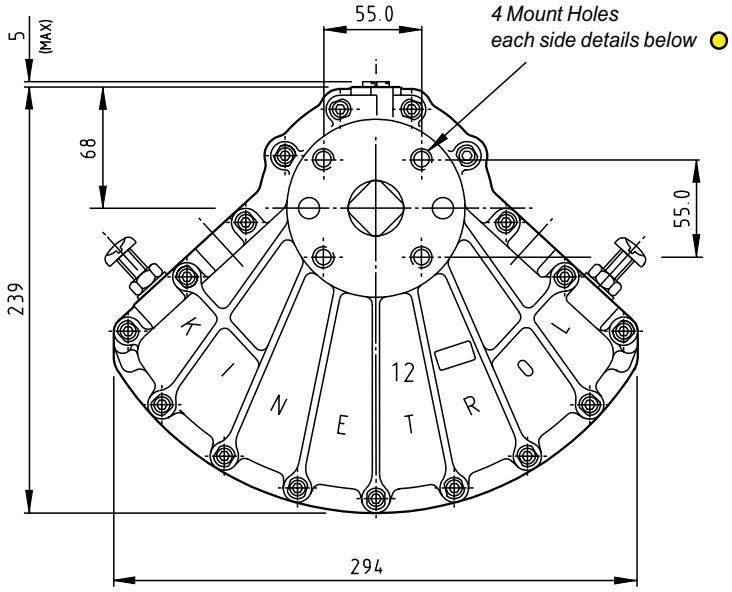


Output torque	5000 lbf.ins/575 Nm at 100 psi/7 bar
Angle of travel	80° - 102° (restricted travel versions available to order)
Displaced volume	86 in³/1410 cm³
Finish	Epoxy stove enamel
Weight	26.2 lb/11.9 kg (excluding coupling)

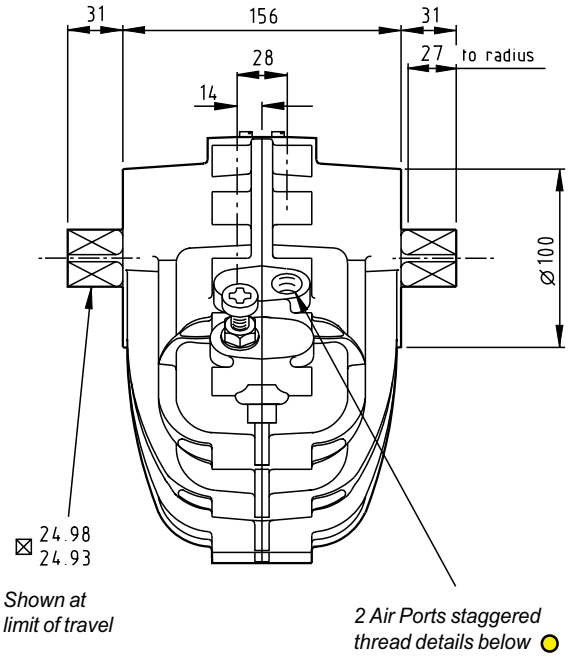
For further information see General Specification, page 41.



STANDARD COUPLING (supplied with actuator weight 1.3 lbs/0.6 kg)



4 Mount Holes each side details below ○



Shown at limit of travel

2 Air Ports staggered thread details below ○

options

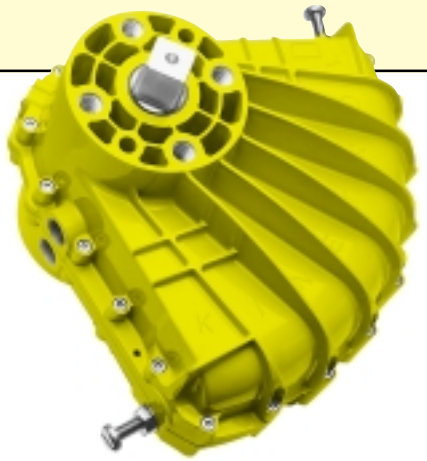
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- Integral solenoid valve
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner - full range of options see pages 11 & 12
- 3 stop positioner
- 180° model
- Geared manual override
- Female drive and mounting details to DIN 3337 and ISO 5211
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 6/14/17/35/36/37/38

○ **Air Ports/Mount Holes**

Model	Air Ports	Mount Holes
120-100	G3/8"	M12 x 24 deep x 77.8 PCD
128-100	G3/8"	M12 x 24 deep x 77.8 PCD
129-100	3/8" NPT	1/2"-20 UNF x 15/16" deep on 3.06" PCD

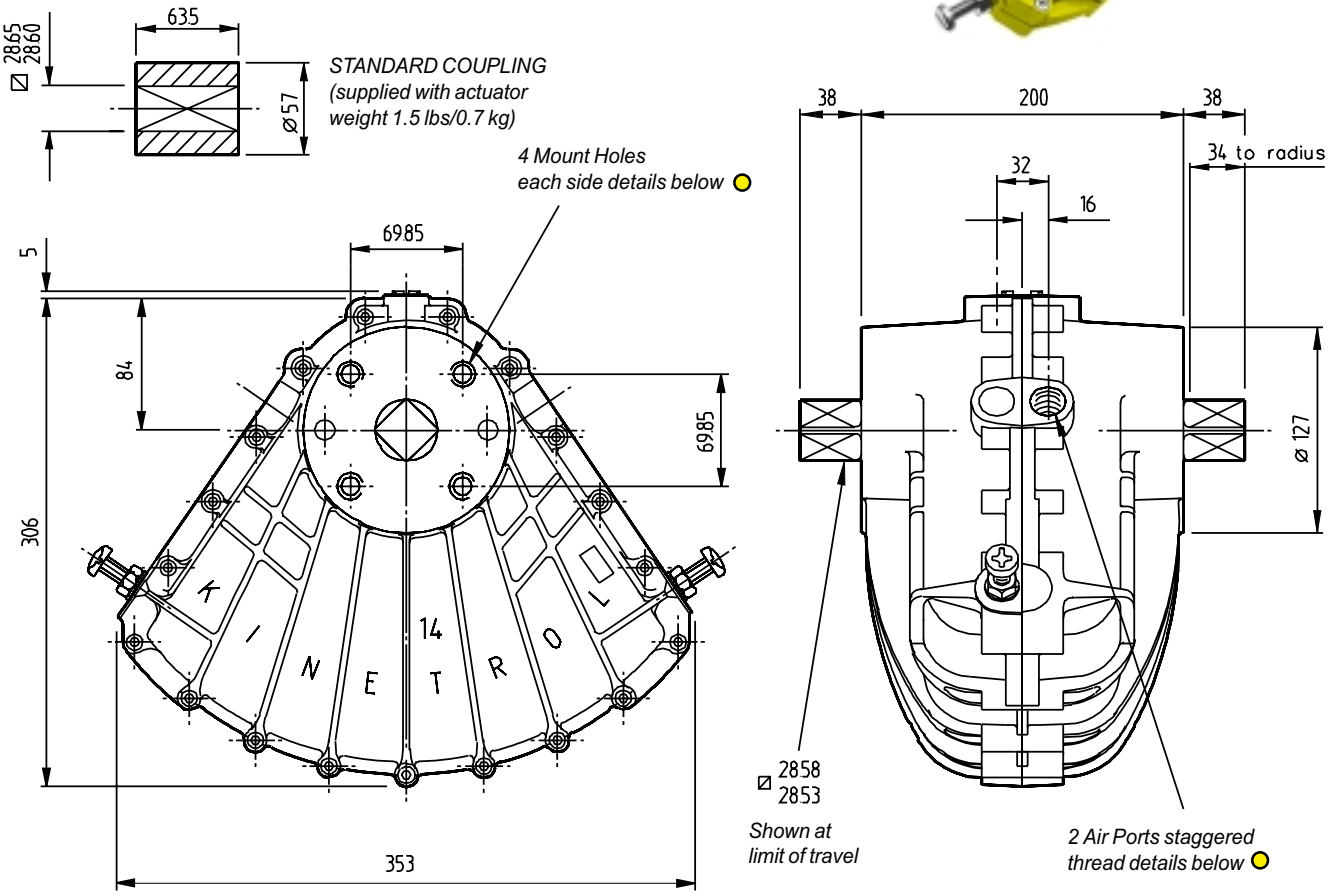
ENGLISH DIMENSIONS see page 34

model 14



Output torque	12000 lbf.ins/1375 Nm at 100 psi/7 bar
Angle of travel (adjustable)	78° – 93° (restricted travel versions available to order)
Displaced volume	201 in^3/3294 cm^3
Finish	Epoxy stove enamel
Weight	44.5 lb/20.2 kg (excluding coupling)

For further information see General Specification, page 41.



options

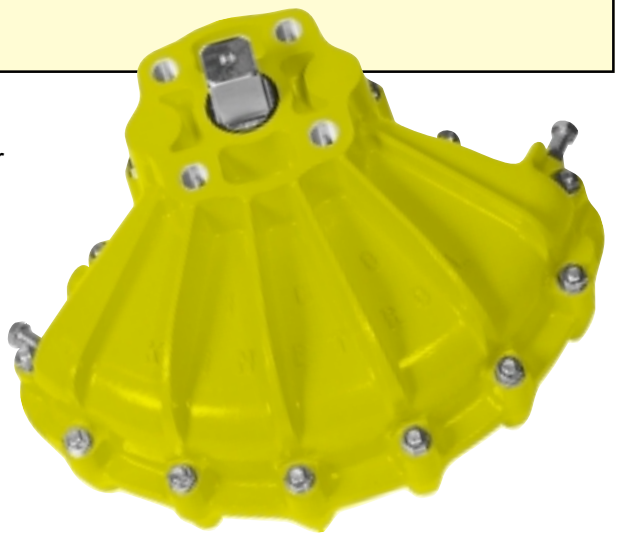
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- Integral solenoid valve
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner - full range of options see pages 11 & 12
- 3 stop positioner
- Geared manual override
- 180° model
- Female drive and mounting details to DIN 3337 and ISO 5211
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 6/14/17/35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
140-100	G1/2"	M16 x 28 deep x 98.8 PCD
148-100	G1/2"	M16 x 28 deep x 98.8 PCD
149-100	1/2" NPT	5/8-18 UNF x 1.12" deep on 3.89" PCD

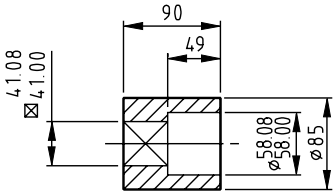
ENGLISH DIMENSIONS see page 34

model 16

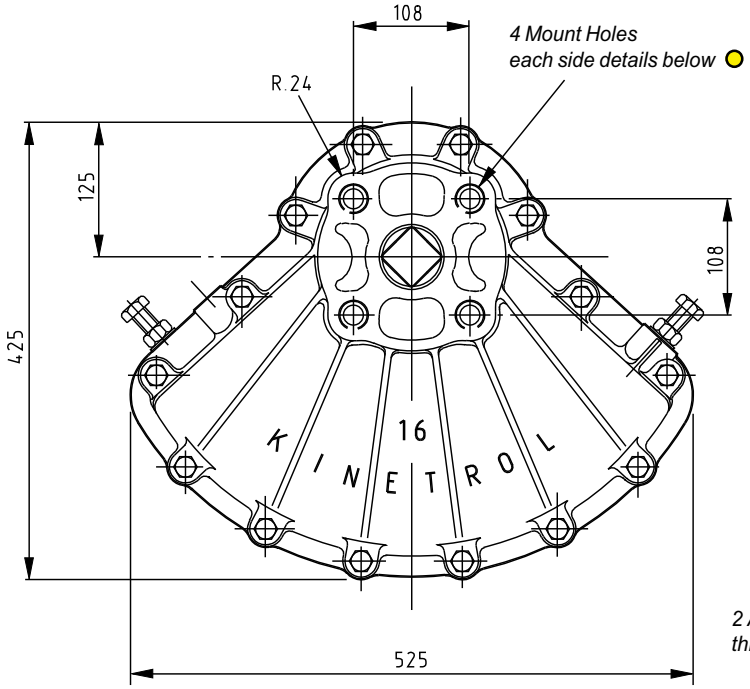


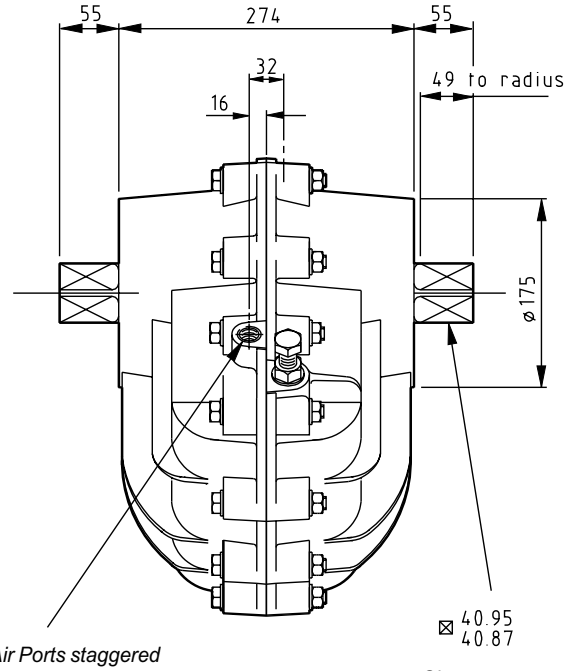
Output torque	27000 lbf.ins/3100 Nm at 100 psi/7 bar
Angle of travel	80° - 100° (restricted travel versions available to order)
Displaced volume	465 in³/7630 cm³
Finish	Epoxy stove enamel
Weight	82.5 lb/37.4 kg (excluding coupling)

For further information see General Specification, page 41.



STANDARD COUPLING (supplied with actuator weight 5.3 lbs/2.4 kg)





2 Air Ports staggered thread details below

Shown at limit of travel

options

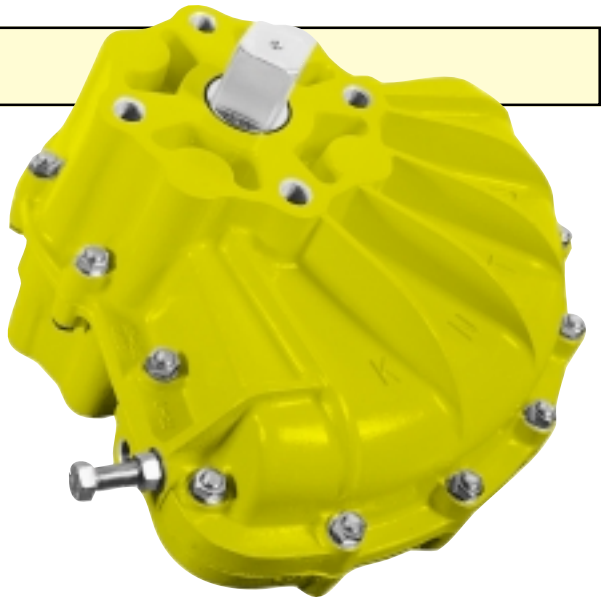
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner - full range of options see pages 11 & 12
- 180° model
- Geared manual override
- Female drive and mounting details to DIN 3337 and ISO 5211
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 6/14/17/35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
160-100	G1/2"	M24 x 38 deep x 152.7 PCD
168-100	G1/2"	M24 x 38 deep x 152.7 PCD
169-100	1/2" NPT	7/8"-9 UNC x 1 1/2" deep on 6.012" PCD

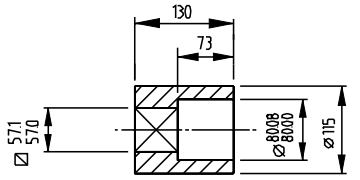
ENGLISH DIMENSIONS see page 34

model 18

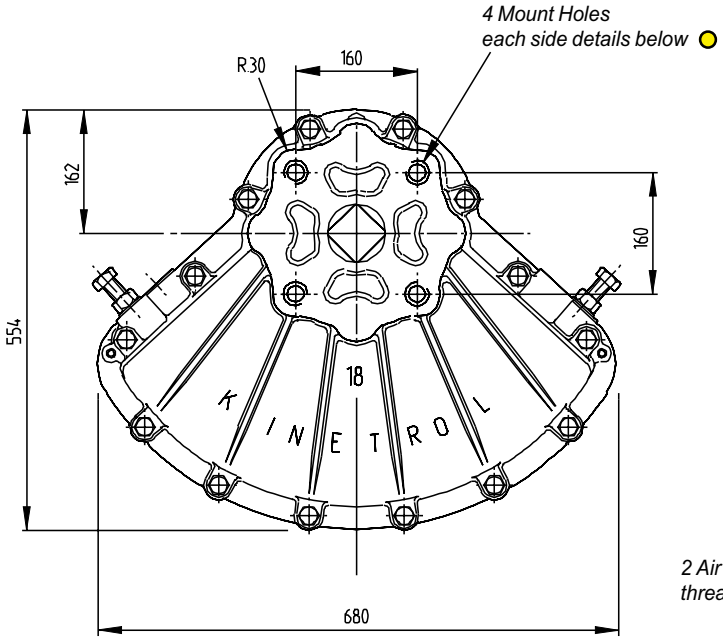


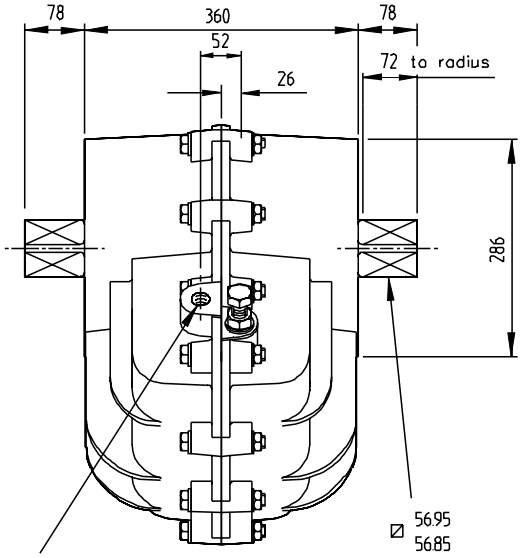
Output torque	60000 lbf.ins/6900 Nm at 100 psi/7 bar
Angle of travel (adjustable)	80° – 100° (restricted travel versions available to order)
Displaced volume	1048 in^3/17170 cm^3
Finish	Epoxy stove enamel
Weight	157.4 lb/71.4 kg (excluding coupling)

For further information see General Specification, page 41.



STANDARD COUPLING (supplied with actuator weight 13.7 lbs/6.2 kg)





2 Air Ports staggered thread details below

Shown at limit of travel

options

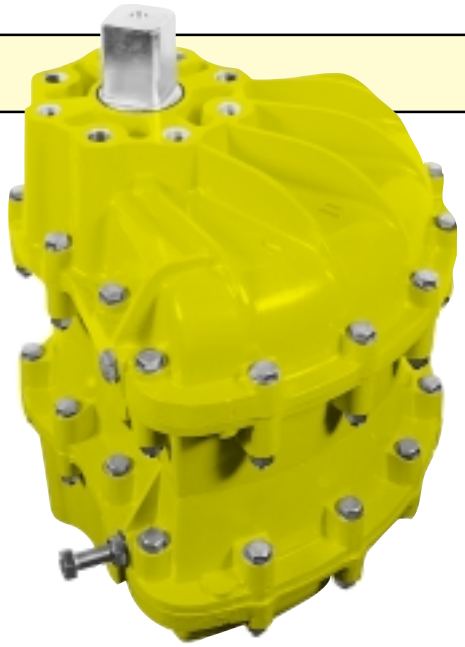
- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner - full range of options see pages 11 & 12
- Code identification see page 32
- Torque outputs see pages 39/40
- Size details of options see pages 35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
180-100	G1/2"	M30 x 50 deep x 226.3 PCD
188-100	G1/2"	M30 x 50 deep x 226.3 PCD
189-100	3/4" NPT	1 1/8"-7 UNC x 2.0" deep on 8.91" PCD

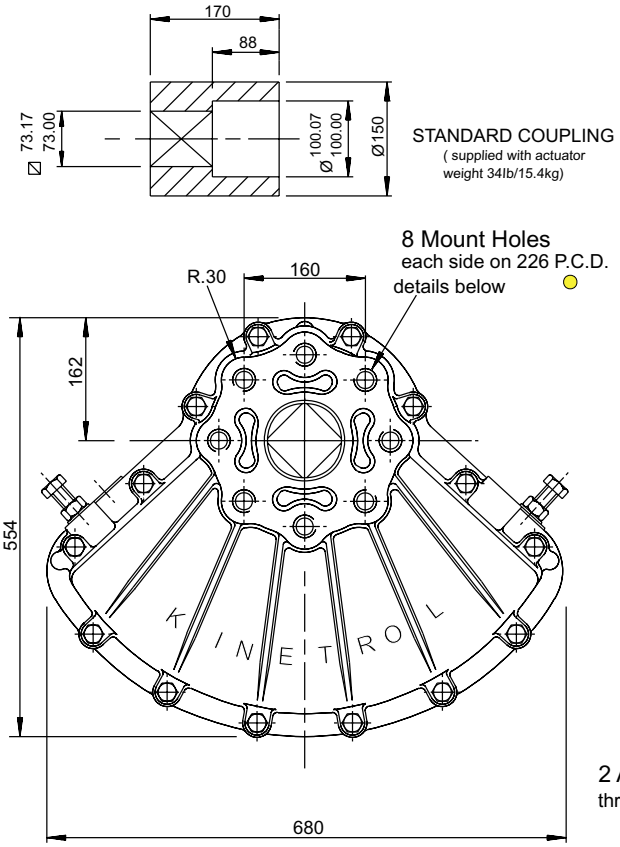
ENGLISH DIMENSIONS see page 34

model 20



Output torque	112000 lbf.ins/12760 Nm at 100 psi/7 bar
Angle of travel	80° - 100° (restricted travel versions available to order)
Displaced volume	2034 in^3/33350 cm^3
Finish	Epoxy stove enamel
Weight	407 lb/184.6 kg (excluding coupling)

For further information see General Specification, page 41.



options

- Fail safe spring return units - clockwise or counter clockwise
- Limit switch boxes for open/close indication - various switches for all hazardous areas
- AP pneumatic positioner - full range of options see pages 7 & 8
- EL electropneumatic positioner - full range of options see pages 11 & 12
- Code identification see page 42
- Torque outputs see pages 39/40
- Size details of options see pages 35/36/37/38

Air Ports/Mount Holes

Model	Air Ports	Mount Holes
200-100	G1"	M30 x 50 deep x 226 PCD
208-100	G1"	M30 x 50 deep x 226 PCD
209-100	1" NPT	$1^1/_8$"-7UNC x 2.0" deep on 8.91" PCD

ENGLISH DIMENSIONS see page 34

ordering codes

Kinetrol Actuators & Add-On Control Units

MODEL SIZE/THREAD CODE	ACTUATOR or ACTUATOR/POSITIONER ASSEMBLY	SPRING RETURNS	LIMIT SWITCH	OPTIONAL SUPPLEMENTARY CODE
0 1 0 to **2 0 0** ISO Thread standard	**0** No Actuator	**0** No Spring Return	**0** No Limit Switch	**1 0 0 6** Manual failsafe spring unit (single spring)
0 1 8 to **2 0 8** Pg cable entry Thread standard	**1** With actuator	**2** Spring Return cw	**1** Proximity sensors 2 off (i) safe	**1 0 0 7** Manual failsafe spring unit (double spring)
0 1 9 to **2 0 9** ANSI Thread standard	**2** Actuator & 3 port single solenoid	**3** Spring Return ccw	**2** Pneumatic switches 2 off	**1 2 0 1** Fire failsafe spring unit (05 size)
0 3 1 to **1 6 1** DIN Flange standard (female drive)	**3** Actuator & 5 port single solenoid		**3** EEx e II T6 certified switches 2 off	**1 2 0 2** Fire failsafe spring unit (2 x 05 size)
0 3 2 to **1 4 2** DIN Flange standard with NAMUR Adaptor	NB Other solenoids by description		**4** V3 microswitches 2 off	**1 3 0 2** Discrete limit switch unit (non latchable)
0 3 3 to **1 4 3** DIN Flange Actuator for Positioner	**9** Special Product Specifications - contact Kinetrol		**5** 20-260 V ac proximity sensors	**1 3 0 5** Discrete limit switch unit (latchable)
0 3 4 to **1 4 4** Actuator only for Positioner ISO/DIN Threads	① Give electrical details. (Volts & Hertz.)		**6** 5-60 V dc proximity sensors	**2 1 0 0** Viton seals
0 3 7 to **1 4 7** Actuator only for Positioner ANSI Thread			**7** V3 microswitches 4 off	

Abbreviations:

cw: *clockwise*

ccw: *counter (or anti-) clockwise*

AP positioner odering codes	*- see pages 7/8*
EL positioner ordering codes	*- see pages 11/12*
3-stop positioner ordering codes	*- see page 10*
180° actuator ordering codes	*- see pages 13/14*
Stainless steel actuator ordering codes	*- see page 33*
Geared manual overrides	*- see page 17*
Low air pressure application ordering codes	*- see page 4*

EXAMPLES

A.	050-100	Double Acting Actuator (ISO Threads) No optional supplementary item.
B.	050-120M	***A +*** spring return (fail-safe CW) + clear cone monitor
C.	058-104	Double acting actuator + limit switch unit (2 x V3) with Pg cable entry thread
D.	059-101	Double acting actuator (ANSI threads) + limit switch (2 x proximity sensors) with ANSI conduit entry
E.	140-130-4900	140 actuator (ISO threads) + spring return fail-safe CCW (2 x 120 springs)

Optional Suffixes:

M: Clear Cone position monitor

N: Namur Adaptor

S: Solenoid valve silencers /flow regulators

Z: Less coupling

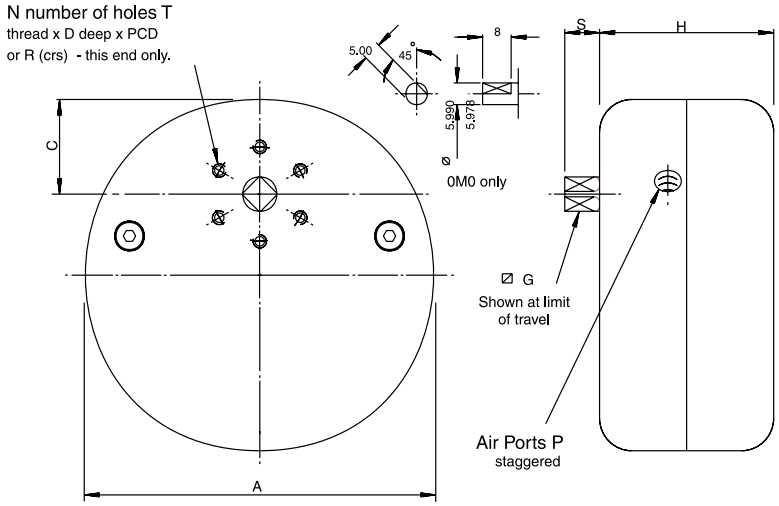
stainless steel actuators

- **Corrosion resistant - 316 stainless steel**
- **The best possible hygiene from the cleanest design in the industry**
- **All the benefits of Kinetrol vane actuators - robust, high reliability, low maintenance, up to 4 million operations guaranteed life**
- **Four double acting units available with torques up to 440 lbf.ins/124 Nm at 100 psi/7.0 bar**
- **Suitable for sterilisation with steam or chemical methods**
- **Optional limit switches available**
  - contact Kinetrol for details

application

Stainless steel actuators are available in double acting models OMO, 02, 03 and 05.

All are available with ISO/ANSI threads and torque outputs and are the same as standard Kinetrol models. The units are also available with a range of stainless steel couplings - for details contact Kinetrol. For torque details see double acting torques pages 39/40.

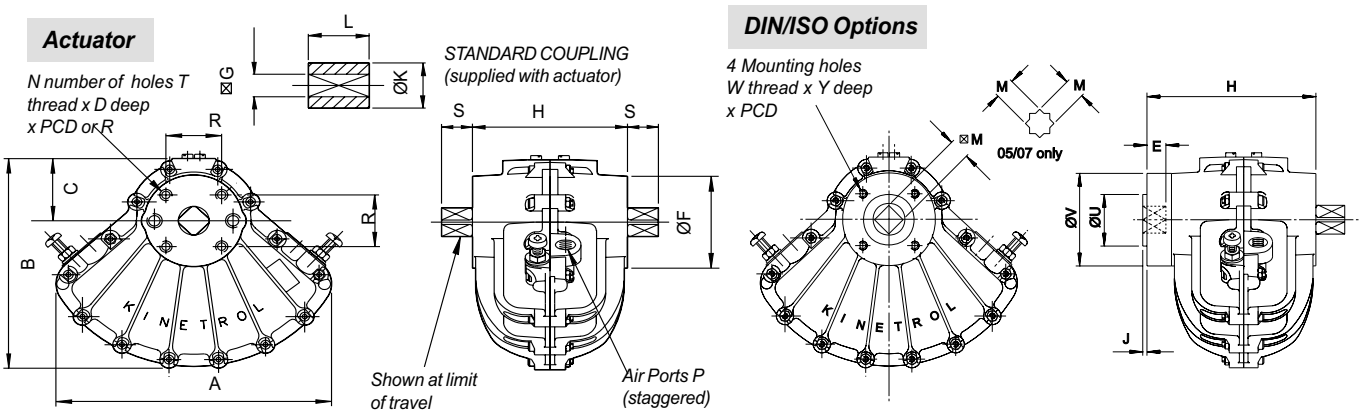


actuator model	A mm	C mm	☒G mm	H mm	S mm	N No.	T ISO	D mm	R mm	PCD mm	P ISO	Wt kgs
OMO-100-2138	34	26	-	36	10.0	4	M3	5	-	16	M5	0.5
020-100-2138	89	24.5	8.0	50	10.0	4	M4	8.0	18.0	25.5	G1/8	1.4
030-100-2138	110	29	9.0	60	12.0	4	M5	10.0	22.0	31.1	G1/8	3.6
050-100-2138	130	35	9.5	65	13.0	6	M5	10.0	-	34.9	G1/8	5.0

specification

Case material	316 stainless steel	**Seals**	PU or Viton
Finish	Machined external	**Seal expanders**	Stainless spring steel
Vane & output shaft	BS3146:Pt2 1975 ANC113/Cr	**Working temperature range**	-20°C to 80°C (up to 150°C with Viton)
Fixings	Stainless steel	**Maximum working pressure**	7 bar/100psi
Shaft seals	PU or Viton		

assembly dimensions



actuator metric units

actuator model	A mm	B mm	C mm	⊠G mm	H mm	ØF mm	S mm	N No.	T ISO	D mm	R mm	PCD mm	P ISO	ØK mm	L mm	Wt kg
OMO	32.0	30.7	12.5		36.0		10.0	4	M3	5.0		16.0	M5			0.12
01	71.4	60.5	14.8	4.8	37.0				SEE PAGE 19				G1/8	9.5	12.7	0.28
01A	71.4	57.3	14.4	4.8	38.5	SEE PAGE 19		4	M4	6.0		19.0	G1/8	9.5	12.7	0.25
02	93.0	76.0	24.1	8.0	50.0		10.0	4	M4	8.0	18.0	25.5	G1/8	16.0	20.0	0.44
03	113.0	91.4	28.0	9.0	60.0	33.6	12.0	4	M5	10.0	22.0	31.1	G1/8	18.0	22.0	0.73
05	136.0	112.0	33.6	9.5	67.0	45.0	13.0	6	M5	10.0		34.9	G1/8	19.0	25.4	1.28
07	178.0	146.0	43.4	16.0	100.0	64.0	20.0	4	M8	16.0	36.0	50.9	G1/4	32.0	40.0	3.30
08	179.0	155.0	41.4	14.3	99.0	63.5	19.0	6	M8	16.0		50.8	G1/4	28.5	39.0	3.25
09	227.0	187.0	54.7	19.0	126.0	84.0	26.0	4	M10	20.0	46.0	65.0	G1/4	38.0	50.0	6.54
10 *	230.0	188.5	58.0	22.0	175.0		25.5	4	M10	16.0	72.1	102.0	G1/4			9.60
12	294.0	239.0	68.0	25.0	156.0	100.0	31.0	4	M12	24.0	55.0	77.8	G3/8	50.0	56.0	12.50
14	353.0	306.0	84.0	28.6	200.0	127.0	38.0	4	M16	28.6	69.9	98.8	G1/2	57.0	63.5	20.91
16	525.0	425.0	125.0	41.0	274.0	175.0	55.0	4	M24	38.0	108.0	152.7	G1/2	85.0	90.0	39.77
18	680.0	554.0	162.0	57.0	360.0	252.0	78.0	4	M30	50.0	160.0	226.3	G1/2	115.0	130.0	77.60
20	692.0	576.0	174.0	73.0	620.0	286.0	100.0	8	M30	50.0	160.0	226.3	G1	150.0	170.0	240.00

* Female drive

actuator english units

actuator model	A inch	B inch	C inch	⊠G inch	H inch	ØF inch	S inch	N No.	T UNF	D inch	R inch	PCD inch	P NPT	ØK inch	L inch	Wt lb
OMO	1.26	1.21	0.49		1.42		0.39	4		0.20		0.630				0.26
01	2.81	2.38	0.58	0.187	1.46				SEE PAGE 19				1/8	0.375	0.50	0.62
01A	2.81	2.26	0.57	0.187	1.52	SEE PAGE 19		4	8-36	0.24		0.750	1/8	0.375	0.50	0.55
02	3.67	3.00	0.95	0.315	1.97		0.39	4	8-36	0.32	0.709	1.000	1/8	0.63	0.79	0.97
03	4.45	3.60	1.10	0.354	2.36	1.32	0.47	4	10-32	0.39	0.866	1.225	1/8	0.71	0.87	1.60
05	5.35	4.41	1.32	0.375	2.64	1.77	0.51	6	10-32	0.39		1.375	1/8	0.75	1.00	2.82
07	7.01	5.75	1.71	0.630	3.94	2.52	0.79	4	5/16-24	0.63	1.417	2.000	1/4	1.26	1.58	7.28
08	7.05	6.10	1.63	0.562	3.90	2.50	0.75	6	5/16-24	0.63		2.000	1/4	1.12	1.54	7.16
09	8.94	7.37	2.16	0.748	4.96	3.31	1.02	4	3/8-24	0.79	1.811	2.560	1/4	1.50	1.97	14.42
10*	9.06	7.42	2.28	0.870	6.89		1.00	4	3/8-24	0.63	2.839	4.016	1/4			21.20
12	11.57	9.41	2.68	0.984	6.14	3.94	1.22	4	1/2-20	0.94	2.165	3.060	3/8	1.97	2.20	27.56
14	14.06	12.05	3.38	1.125	7.87	5.00	1.50	4	5/8-18	1.13	2.750	3.890	1/2	2.24	2.50	46.10
16	20.67	16.73	4.92	1.614	10.79	6.90	2.17	4	7/8-9**	1.50	4.250	6.010	1/2	3.35	3.54	87.70
18	26.77	21.81	6.38	2.244	14.17	9.92	3.07	4	1 1/8-7**	2.00	6.300	8.910	1/2	4.53	5.12	171.00
20	27.24	22.68	6.85	2.874	24.41	11.26	3.94	8	1 1/8-7**	2.00	6.300	8.910	1	5.91	6.69	528.00

* Female drive
** UNC

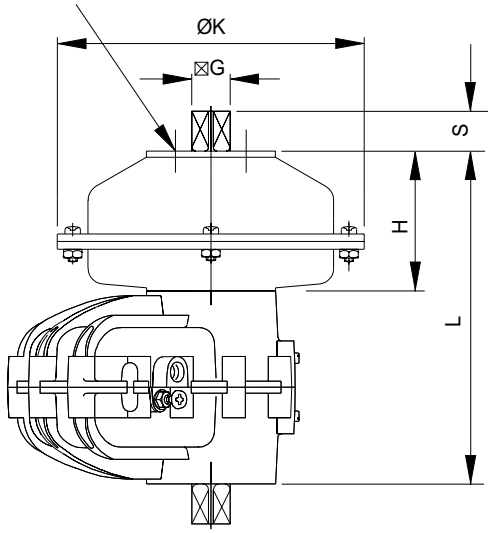
DIN/ISO options

actuator model	H mm	DIN/ISO Flange No.	⊠M mm	V mm	U mm	PCD mm	W	Y (min) mm	J mm	E mm
021-100	50.0	F03	9	46	25	36	M5	8	2	10
031-100	74.0	F03	9	46	25	36	M5	8	2	10
051-100	81.0	F04	11	54	30	42	M5	8	2	12
071-100	117.0	F05	14	64	35	50	M6	10	3	16
091-100	146.0	F07	17	90	55	70	M8	13	3	19
121-100	180.5	F10	22	125	70	102	M10	16	3	24
141-100	226.5	F12	27	150	85	125	M12	20	3	29
161-100	380.0	F16	46	203	130	165	M20	32	4	48

spring return actuator dimensions

Mount hole orientation same as actuator except model 01 and low pressure combinations (set for below 5.5 bar / 80 psi)

N number of holes
T thread x D deep x PCD



metric units

actuator model	L mm	H mm	ØK mm	⊠G mm	S mm	N No.	T ISO	D mm	PCD mm	Wt kg
01-120	60.2	23.2	58.8	4.8	7.2	3	M3	4.0	15.9	0.53
01A-120	61.7	23.2	58.8	4.8	7.2	3	M3	4.0	15.9	0.50
02-120	90.0	40.0	73.0	8.0	10.0	4	M4	8.0	25.5	0.84
03-120-5600	100.0	40.0	73.0	8.0	10.0	4	M4	8.0	25.5	1.13
03-120	107.0	47.0	108.0	9.0	12.0	4	M5	10.0	31.1	2.08
05-120	114.0	47.0	108.0	9.5	13.0	6	M5	8.0	34.9	2.63
07-120-4000	155.3	55.3	108.0	9.5	13.0	6	M5	8.0	34.9	4.65
07-120	182.0	82.0	152.0	16.0	20.0	4	M8	16.0	50.9	7.26
08-120-4100	181.0	82.0	152.0	16.0	20.0	4	M8	16.0	50.9	7.21
08-120	191.0	92.0	200.0	14.3	19.0	6	M8	12.0	50.8	11.48
09-120-4200	208.0	82.0	152.0	16.0	20.0	4	M8	16.0	50.9	10.50
09-120	218.0	92.0	200.0	19.0	26.0	4	M10	20.0	65.0	14.77
10-120-5800	265.0	92.0	200.0	19.0	26.0	4	M10	20.0	65.0	17.85
10-120	285.0	112.0	206.0	22.0	26.0	8	M10	16.0	102.0	22.00
12-120-4300	248.0	92.0	200.0	19.0	26.0	4	M10	20.0	65.0	20.73
12-120-4400	340.0	184.0	200.0	19.0	26.0	4	M10	20.0	65.0	28.96
12-120	293.0	136.0	258.0	25.0	31.0	4	M12	22.0	77.8	27.95
14-120-4900	417.0	217.0	258.0	28.6	38.0	4	M16	28.5	98.8	51.81
14-120	374.0	174.0	394.0	28.6	38.0	4	M16	28.5	98.8	71.25
14-120-5000	337.0	137.0	258.0	28.6	38.0	4	M16	28.5	98.8	38.18
16-120-6000	586.0	312.0	394.0	28.6	38.0	4	M16	28.5	98.8	90.00
16-120-6100	450.0	176.0	394.0	41.0	55.0	4	M24	32.0	152.7	75.00
16-120	485.5	211.5	524.0	41.0	55.0	4	M24	38.0	152.7	123.0
18-120-7000	571.5	211.5	524.0	57.0	78.0	4	M30	50.0	226.3	161.0
18-120	671.5	311.5	524.0	57.0	78.0	4	M30	50.0	226.3	240.0
20-120-7200	931.5	311.5	524.0	73.0	100.0	8	M30	50.0	226.3	350.0
20-120-7300	1031.5	411.5	524.0	73.0	100.0	8	M30	50.0	226.3	408.0
20-120	1131.5	511.5	524.0	73.0	100.0	8	M30	50.0	226.3	479.0

* Female drive unless specified.

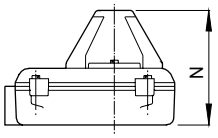
english units

actuator model	L inch	H inch	ØK inch	⊠G inch	S inch	N No.	T UNF	D inch	PCD inch	Wt lb
01-120	2.37	0.91	2.32	0.187	0.28	3		0.16	0.625	1.17
01A-120	2.43	0.91	2.32	0.187	0.28	3	4-48	0.16	0.625	1.10
02-120	3.54	1.58	2.87	0.315	0.39	4	8-36	0.31	1.00	1.85
03-120-5600	3.94	1.58	2.87	0.315	0.39	4	8-36	0.31	1.00	2.49
03-120	4.21	1.85	4.25	0.354	0.47	4	10-32	0.39	1.225	4.58
05-120	4.49	1.85	4.25	0.375	0.51	6	10-32	0.31	1.375	5.80
07-120-4000	6.11	2.18	4.25	0.375	0.51	6	10-32	0.31	1.375	10.25
07-120	7.17	3.23	6.00	0.630	0.79	4	5/16-24	0.63	2.00	16.00
08-120-4100	7.13	3.23	6.00	0.630	0.79	4	5/16-24	0.63	2.00	15.90
08-120	7.52	3.62	7.87	0.563	0.75	6	5/16-24	0.47	2.00	25.31
09-120-4200	8.19	3.23	6.00	0.630	0.79	4	5/16-24	0.63	2.00	23.15
09-120	8.58	3.62	7.90	0.748	1.02	4	3/8-24	0.79	2.56	32.56
10-120-5800	10.43	3.62	7.90	0.748	1.02	4	3/8-24	0.79	2.56	40.30
10-120	11.22	4.41	8.11	0.866	1.02	8	3/8-24	0.63	4.02	48.50
12-120-4300	9.76	3.62	7.90	0.748	1.02	4	3/8-24	0.79	2.56	45.71
12-120-4400	13.39	7.25	7.90	0.748	1.02	4	3/8-24	0.79	2.56	63.86
12-120	11.54	5.35	10.16	0.984	1.22	4	1/2-20	0.87	3.06	61.62
14-120-4900	16.43	8.54	10.16	1.125	1.50	4	5/8-18	1.12	3.89	113.98
14-120	14.72	6.85	15.50	1.125	1.50	4	5/8-18	1.13	3.89	157.00
14-120-5000	13.27	5.40	10.16	1.125	1.50	4	5/8-18	1.13	3.89	84.19
16-120-6000	23.07	12.28	15.50	1.125	1.50	4	5/8-18*	1.13	3.89	198.00
16-120-6100	17.72	6.93	15.50	1.614	2.17	4	7/8-9	1.26	6.01	165.00
16-120	19.11	8.33	20.63	1.614	2.17	4	7/8-9	1.50	6.01	272.00
18-120-7000	22.50	8.33	20.63	2.244	3.07	4	1 1/8-7**	1.97	8.91	356.00
18-120	26.44	12.26	20.63	2.244	3.07	4	1 1/8-7**	1.97	8.91	530.00
20-120-7200	36.67	12.26	20.63	2.874	3.94	8	1 1/8-7**	1.97	8.91	773.00
20-120-7300	40.61	16.20	20.63	2.874	3.94	8	1 1/8-7**	1.97	8.91	901.00
20-120	44.55	20.14	20.63	2.874	3.94	8	1 1/8-7**	1.97	8.91	1058.00

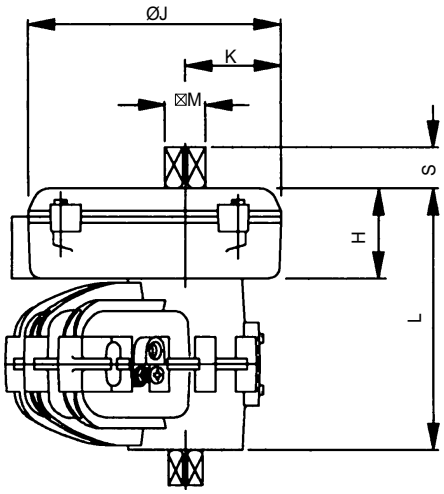
**UNC

Clockwise (120) and counter clockwise (130) units have identical dimensions.

limit switch dimensions



Clear Cone Indicator Option



metric units

actuator model	L mm	H mm	ØJ mm	K mm	⊠M mm	S mm	N mm	Wt kg
02	102	52	72	21	8	10	-	0.81
03	112	52	72	21	8	10	-	1.10
05	111	44	124	47	16	20	89	2.55
07	144	44	124	47	16	20	89	4.47
08	143	44	124	47	16	20	89	4.43
09	170	44	124	47	16	20	89	7.95
10	219	44	124	47	16	20	89	11.01
12	211	55	156	71	25	25	100	15.00
14	255	55	156	71	25	25	100	23.41
16	429	155	156	71	25	25	200	42.63
18	540	180	156	71	25	25	225	79.90

english units

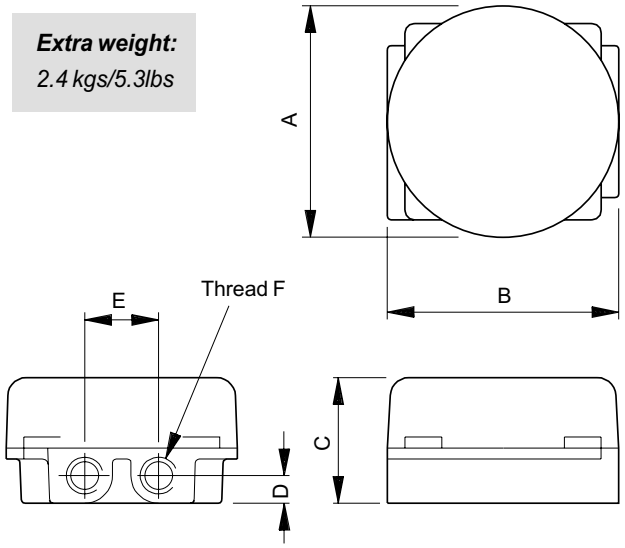
actuator model	L inch	H inch	ØJ inch	K inch	⊠M inch	S inch	N inch	Wt lb
02	4.02	2.05	2.83	0.83	0.315	0.39	-	1.79
03	4.41	2.05	2.83	0.83	0.315	0.39	-	2.42
05	4.37	1.73	4.88	1.85	0.630	0.79	3.50	5.62
07	5.67	1.73	4.88	1.85	0.630	0.79	3.50	9.85
08	5.63	1.73	4.88	1.85	0.630	0.79	3.50	9.77
09	6.70	1.73	4.88	1.85	0.630	0.79	3.50	17.53
10	8.62	1.73	4.88	1.85	0.630	0.79	3.50	24.28
12	8.30	2.17	6.14	2.8	0.984	0.984	3.94	33.07
14	10.04	2.17	6.14	2.8	0.984	0.984	3.94	51.61
16	16.90	6.10	6.14	2.8	0.984	0.984	7.87	93.98
18	21.26	7.10	6.14	2.8	0.984	0.984	8.86	176.15

3 stop pneumatic positioner dimensions

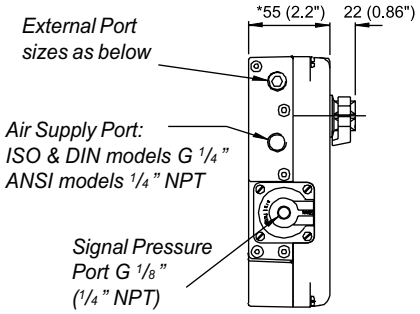
	mm	*inches*
A	125	4.9
B	125	4.9
C	68	2.7
D	15	0.6
E	40	1.6
F:	ISO - M20 x 1.5 DIN - Pg 13.5 ANSI - 1/2 " - 14 NPS	

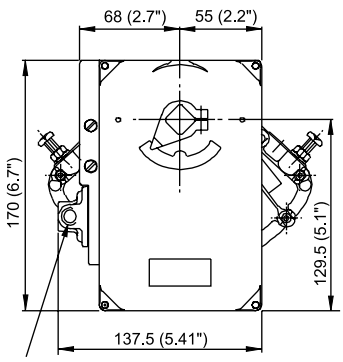
G1/8" air supply port in solenoid mounting interface. ANSI 1/8" NPT.

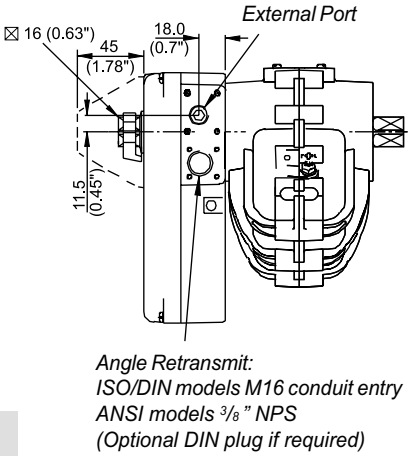
Extra weight:
2.4 kgs/5.3lbs



AP positioner assembly dimensions



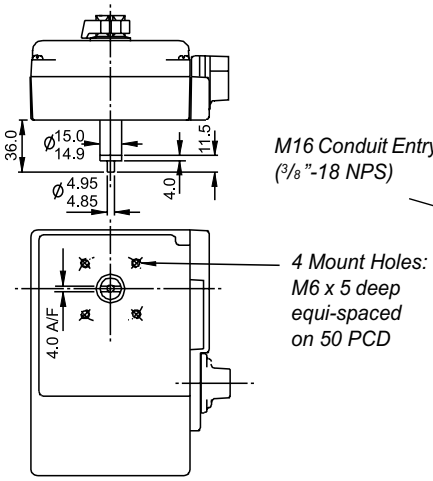




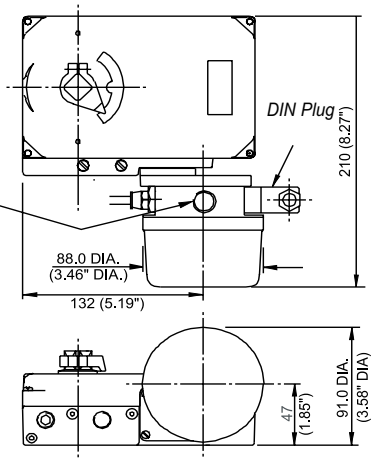
Actuator Model	* Additional Adaptor Dim.
05-10	-
12	15.0 (0.59")
14	18.0 (0.71")

AP Positioner shown direct mounted on a Kinetrol 05 actuator

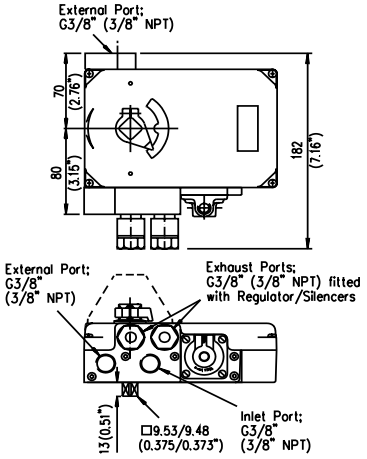
Namur discrete version



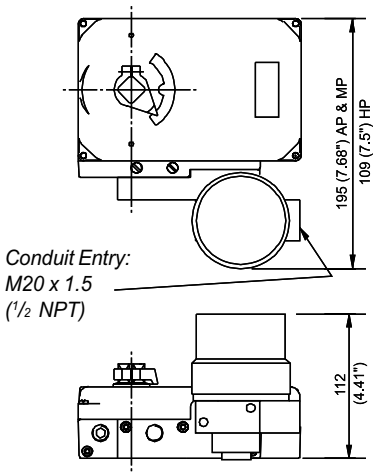
non-hazardous I/P version



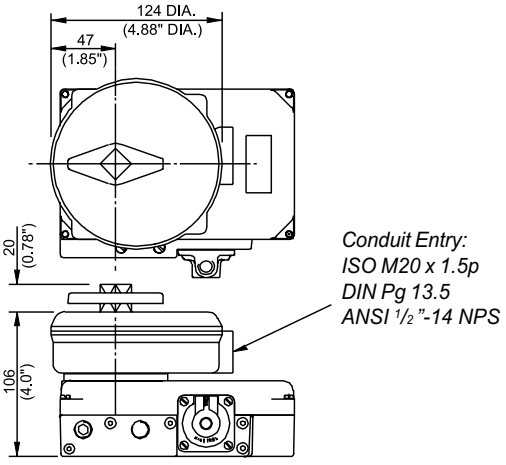
Discrete High Flow Version



explosion proof I/P version

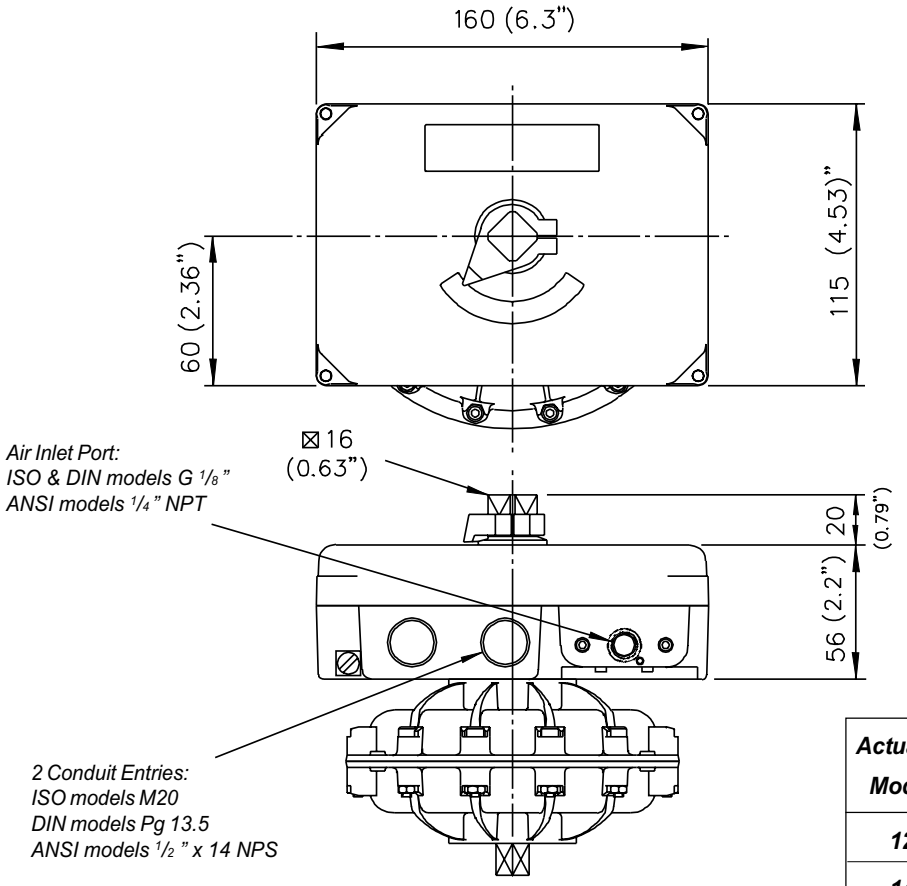


switch box version



Where drawing information is not given - it is the same as direct mount version

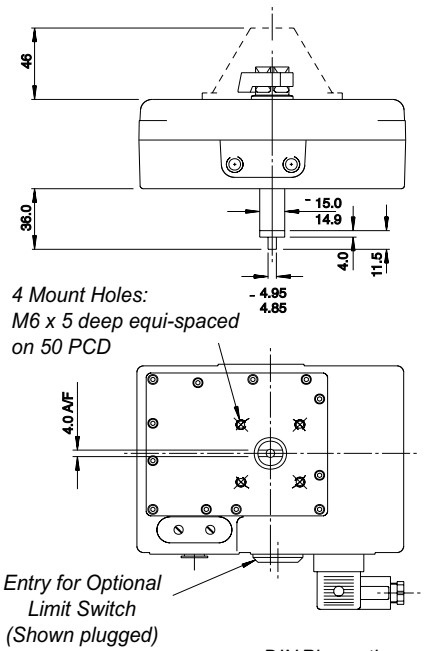
EL positioner assembly dimensions



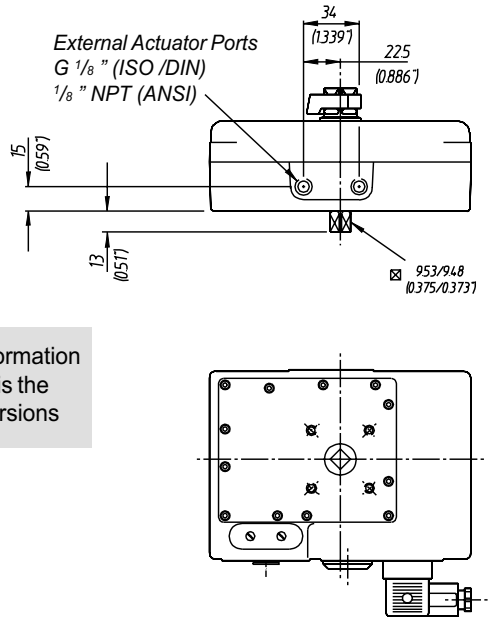
EL Positioner shown direct mounted on a Kinetrol 05 actuator

Actuator Model	** Additional Adaptor Dim.*	*Additional Adaptor Weight*
12	15.0 (0.59")	0.65 kg/1.4 lbs
14	18.0 (0.71")	0.65 kg/1.4 lbs

Namur discrete version



Kinetrol discrete version



Where drawing information is not given - it is the same for both versions

DIN Plug options - shown 90° out of true position ISO/DIN models Pg 11 cable gland (8 to 10 mm dia) ANSI models 1/2" NPT cable entry (for use with flexible conduit).

double acting torque outputs - metric units Nm

actuator model	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
					pressure (bar)							
OMO-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	31	44	57	69	82	95	108	121	134	147	160	173
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
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
20-100	2480	3440	4400	5310	6290	7230	8160	9090	10020	10960	11890	12760

spring return torque outputs - metric units Nm

actuator model	position of air OR spring return stroke	1.7	2.0	2.4	2.8	3.1	3.5	3.8	4.1	4.5	4.8	5.2	5.5
						pressure setting	(bar)						
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	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	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	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
08-120-4100	Start	18.6	23.7	27.1	31.1	35.0	39.5	44.1	48.0	52.5	56.5		
	Finish	7.9	13.6	16.9	20.9	26.0	30.5	35.0	39.0	43.5	47.5	*47.5*	*47.5*
08-120	Start									56.5	61.0	65.5	70.6
	Finish									45.2	50.3	54.8	59.9
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*
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
20-120-7200	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*
20-120-7300	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*
20-120	Start								4121.0	4514.0	4798.0	5181.0	5456.0
	Finish								3046.0	3423.0	3732.0	4133.0	4464.0

Torque outputs identical for Counter Clockwise Models. *Italic* figures apply to spring end torque only - air end torque will be greater.

double acting torque outputs - english units lbf/ins

actuator model	20	30	40	50	60	70	80	90	100
				pressure (psi)					
OMO-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	250	405	560	710	870	1030	1190	1350	1510
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
16-100	5200	7900	10600	13400	16100	18800	21600	24300	27000
18-100	10000	16100	22200	28300	34500	41300	48000	54500	60000
20-100	20000	32000	43000	54500	66000	78000	89000	100500	112000

spring return torque outputs - english units lbf/ins

actuator model	position of air OR spring return stroke	20	30	35	40	45	50	55	60	65	70	75	80
							pressure setting (psi)						
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	Start						56	61	66	71	79	84	91
	Finish						37	41	49	56	64	69	77
05-120	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	Start						270	300	330	360	385	415	450
	Finish						175	210	240	270	305	340	375
08-120-4100	Start	165	210	240	275	310	350	390	425	465	500		
	Finish	70	120	150	185	230	270	310	345	385	420	*420*	*420*
08-120	Start									500	540	580	625
	Finish									400	445	485	530
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*
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
20-120-7200	Start	14346	17169	20576	23824								
	Finish	9071	12054	15603	*19497*	*19497*	*19497*	*19497*	*19497*	19497	19497	19497	19497
20-120-7300	Start				24674	27187	30718	33090	35604				
	Finish				17328	20098	23293	26400	*29125*	*29125*	*29125*	*29125*	*29125*
20-120	Start								36471	39949	42462	45852	48286
	Finish								26957	30294	33028	36577	39506

Torque outputs identical for Counter Clockwise Models. ***Italic*** **figures apply to spring end torque only - air end torque will be greater.**

actuator general specification

Casing	Pressure die cast ILZRO 16 zinc alloy. Models 16/18/20 aluminium LM25.
Vane and output shaft	Models OMO, 01, 02, 03, 05 stainless steel. Models 07 upwards SG iron, zinc plated.
Shaft bushes	Models OMO, 02, 03 and 05 Delrin bushes. Glacier DU for all other models.
Seals	Moulded polyurethane. Viton seals also available - contact Kinetrol
Seal expanders	Stainless spring steel.
Couplings	Weldable mild steel, zinc plated.
Working temperature range	-20°C (-5°F) to 80°C (175°F). Up to 100°C with high temperature seals and 150°C with special equipment (contact Kinetrol).
Maximum working pressure	100 psi (7 bar).
Maximum overload pressure	150 psi (10 bar).

valve mounting service

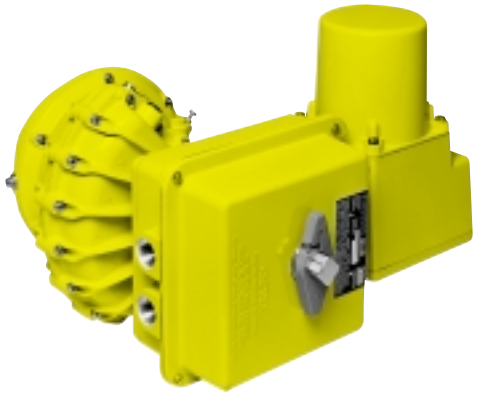
With 30 years experience and almost 2000 mounting kit designs available to suit most ball, butterfly and plug valves, Kinetrol has the expertise to design, build and test actuated valve packages for any service. We can supply valves fitted with actuators and will mount actuators to free issued valves.

spring to centre actuator

The actuator may be air driven 45° from an inital centre position, in either direction, and will spring return to an accurate and positive centre when the air supply is removed.

Ask for sales leaflet KF-425

spring fail-safe electric actuators



Kinetrol's electrohydraulic actuator is designed for use in areas without compressed air.
A hydraulic pump delivers pressurised oil to a Kinetrol quarter-turn actuator, providing torque outputs up to 1220 Nm/10800 lbf.in. On power failure a Kinetrol spring return and fail-open solenoid valve produce a positive fail-safe action. A pressure release valve and 100% rated pump motor provide stall protection. This together with the unit's capacity for 3000 starts per hour make it ideal for high cycle double acting and modulating applications.

Ask for sales leaflet no. KF125

rotary dampers

Kinetrol's range of fluid dashpots are used to steady drives, decelerate motion and damp vibration. Standard designs include adjustable or fixed rate devices for continuous rotation or restricted travel applications. If required Kinetrol will engineer special dampers to your specification.

Ask for catalogue no. KF72

Contents Guide

AUSTRALIA
IMI Norgren Pty Ltd
PO Box 457
Knoxfield
Victoria 3180
Tel - (03) 9213 0800
Fax - (03) 9213 0898
email - sayub@norgren.com.au

BELGIUM
NV PRODIM SA
Rue G. Van Laethem Straat 67
B1140
Brussels
Tel - 02 726 3300
Fax - 02 726 3633
email - prodim@brutele.be

CANADA
GGOSCO Engineering Inc
1272 Speers Road (Unit 4)
Oakville
Ontario L6L 5T9
Tel - (905) 825 2627
Fax - (905) 825 4051
email - sales@ggosco.com

CHINA
Shanghai Hanwai Special
Valve Manufacturing Co. Ltd
269 Ningwu Road
Shanghai 200090
Tel - 21 65183703
Fax - 21 65431747
email - hwvalve@citiz.net

DENMARK
Armatec A/S
Mjolnersvej 4-8
DK-2600 Glostrup
Tel - 4696 0000
Fax - 4696 0001
email - armatec@armatec.dk

FINLAND
Aseko Oy
Tinankuja 3
FIN-02430 Masala
Tel - 09 221011
Fax - 09 22101200
email - markkinointi@aseko.fi

FRANCE
Kinetrol sarl
Actigone 3 - BP1028
74966 MEYTHET cedex
Tel - (0) 450 22 19 26
Fax - (0) 450 22 31 54
email - Kinetrol@kinetrol.fr

GERMANY
Dietrich Schwabe GmbH
Odenwaldstrasse 61
63322 Rödermark
Tel - 06074 89590
Fax - 06074 90008
email - info@schwabe-sra.de

HONG KONG
IMI Norgren Ltd
6/F Benson Tower
74 Hung To Road
Kwun Tong
Kowloon
Tel - 2492 7608
Fax - 2498 5878
email - benny@norgren.com.hk

HUNGARY
YERUHAM Muvek Kft
1133 Budapest XIII. District
vésö str.9-11
Tel - 1 412 4161
Fax - 1 412 4171
email - yeruham@yeruham.hu

INDIA
Peregrine Technologies Pvt Ltd
c/212 New Usha Nagar
Village Road
Bhandup (w)
Mumbai 400 078
Tel - 22 560 3924
Fax - 22 569 5722

ISRAEL
Baccara Geva
Kvutzat Geva
18-915
Tel - 4653 5960
Fax - 4653 1445
email - baccara@netvision.net.il

ITALY
Bellkin Srl
Via Torricelli 51
20038 Seregno
Milano
Tel - 0362 330269
Fax - 0362 336233
email - info@bellkin.com

JAPAN
HKS Japan Ltd
Promity Fuchinobe Bld
1-9-15 Kanumadai
Sagamihara
Kanagawa 229-0033
Tel - 042 751 9131
Fax - 042 751 9700
email - info@hksjapan.co.jp

KOREA
Dolldam Co.Ltd
5FL, Kyunghee B/D,
571 - 6 Dokok - Dong
Kangnam -Ku,
Seoul
Korea
Tel - 02 572 1219
Fax - 02 572 1037
email - topvalve@hitel.net

NETHERLANDS
Delan Bv
Postbox 218
2180 AE
Hillegom
Tel - 0252 528 870
Fax - 0252 528 470
email - info@delon.org

NEW ZEALAND
IMI Norgren Ltd
3-5 Walls Road
PO Box 12 893
Auckland 5
Tel - (09)579 0189
Fax - (09) 526 3399
email - enquire@norgren.co.nz

PORTUGAL
Safi Iberica SA
C/Cobalt
86-96 nave 6
08907 - L'Hospitalet de Llobergat
Barcelona
Tel - 93 2610255
Fax - 93 3385293
email - safi.esp@teleline.es

SINGAPORE
IMI Norgren Ltd
16 Tuas Street
Singapore 638453
Tel - 862 1811
Fax - 862 1917
email - sales@norgren.com.sg

SOUTH AFRICA
Yokogawa South Africa (Pty) Ltd
PO Box 2194
Southdale 2135
Tel - (011) 681 2500
Fax - (011) 680 0206
email - markb@yokogawa.co.za

SPAIN
Safi Iberica SA
C/Cobalt
86-96 nave 6
08907 - L'Hospitalet de Llobergat
Barcelona
Tel - 93 2610255
Fax - 93 3385293
email - safi.esp@teleline.es

SWEDEN
Alnab Valves & Instruments AB
433 86 PARTILLE
Tel - 31 449450
Fax - 31 442455
email - alnab@alnab.se

SWITZERLAND
Xorella - Frank AG
Hardstrasse 41
CH-5430 Wettingen
Tel - 56 438 0840
Fax - 56 438 0849
email - info@xorella-frank.ch

TAIWAN
Controltek International Co. Ltd
4th Fl. No. 20 Alley 18
Lane 478, Rui-Guang Road
Nei-Hu, Taipei 114
Tel - 2 26277671
Fax - 2 26277673
email - contek@ms14.hinet.net

TURKEY
ProMIS Ltd Sti
Gelincik Sok 3A/1
Guvenevler
Kavaklidere
Ankara 06700
Tel - 312 426 5440
Fax - 312 426 1702
email - promisec@superonline.com

USA
Kinetrol USA Inc
4557 Westgrove Drive
Addison
Texas 75001
Tel - 972 447 9443
Fax - 972 447 9720
email - sales@kinetrolusa.com

KINETROL

Kinetrol Ltd, Trading Estate, Farnham, Surrey, GU9 9NU, England
Telephone: 01252 733838 Fax: 01252 713042
www.kinetrol.com email - sales@kinetrol.com

KF - 84 01/02