

# Conoflow

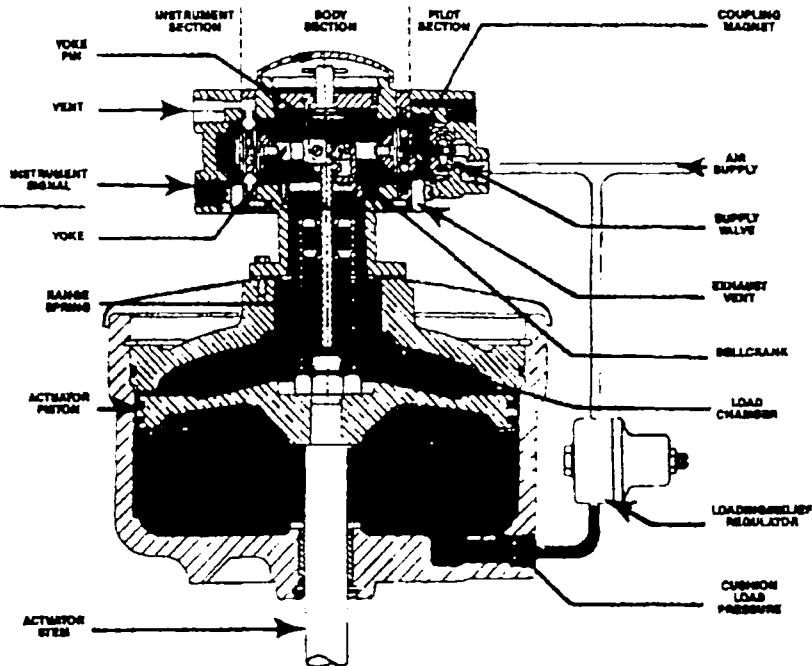


## ITT Industries

*Engineered for life*

**WARNING**  
Conoflow's products are designed and manufactured using materials and workmanship required to meet all applicable industry standards. The use of these products should be confined to services specified and/or recommended in the Conoflow catalogs, instructions or by Conoflow application engineers (i.e. exceeding pressure, temperature rating or using device for services other than those specified).  
To avoid personal injury or equipment damage due to misuse or misapplication of a product, it is necessary to select the proper materials of construction and pressure/temperature ratings which are consistent with performance requirements.

### INSTRUCTION AND MAINTENANCE MANUAL GC31 COMMANDAIRE POSITIONER



#### PRINCIPLE OF OPERATION

The COMMANDAIRE Model GC31 positions the actuator by applying sufficient air pressure above the piston to overcome cushion-loading pressure (pressure below piston set by an adjustable pressure reducing/relief type regulator) plus any external forces or load acting on the stem. An increase in air signal creates a force on the instrument diaphragm moving yoke to right, closing exhaust port and opening supply valve. Air flows through supply valve into chamber

above piston and moves it downward. This extends a calibrated range spring causing bellcrank to pivot counterclockwise, exerting force against yoke pin, restoring yoke to normal balanced position. A decrease in instrument air pressure reverses the procedure, closing supply valve and opening exhaust port venting to atmosphere excess air pressure above actuator piston.

## SUPPLY PRESSURE (20 to 100 PSI)(138 to 690 kPa)

A regulated-filtered air supply should be used. A Conoflow Model GFH60 Airpak-Filter Regulator or equal is recommended.

## ZERO ADJUSTMENT

Zero adjustment can be made by turning the zero adjust coupling (2) clockwise or counterclockwise. Connect supply and instrument air to the positioner. Set the instrument signal to the 0% value (e.g., 3 PSI(21 kPa) for a 3-15 PSI(21-143 kPa) range). Turn the zero adjust coupling to bring the actuator slightly off of the fully retracted position. The starting point may then be checked by reducing the instrument signal below the 0% value and then slowly increasing it. As the 0% input signal is reached, extension of the actuator stem plus an audible increase in the air flow through the positioner should be observed.

Next, increase the instrument signal to the 100% value (e.g. 15 PSI for 3-15 PSI range)(e.g., 103 kPa for 21-103 kPa range). Verify that the actuator stem moves to the fully extended position.

Set the instrument signal to the 50% value. Using a suitable measuring device such as a scale, and verify that the actuator stem has extended to 50% of full stroke.

## SPAN

Positioner span determines the control range. A positioner with a 3-15 PSI(21-103 kPa) range has a 12 PSI(83 kPa) span and is set with a 3 PSI(21 kPa) start point (retracted position). Positioner span has been factory calibrated as specified. Instrument signals of 3-9, 3-15 and 6-30 PSI(21-62, 21-103 and 41-207 kPa) are available. For field changes, refer to page 5.

## REMOVING POSITIONER FROM ACTUATOR

Shut off supply and instrument air before performing any maintenance.

Piston or diaphragm should be in the fully retracted position. Disconnect tubing and bleed all air out of the actuator. Remove cap (1) from positioner and spirolox ring (3), so that head plate assembly (2) can be lifted out. Loosen setscrew (24) using 1/8" Allen Wrench and remove spring rod nut (16)\*. Remove six capscrews (14) and lift positioner from actuator.

## INSTALLING POSITIONER ON ACTUATOR

The Model GC31 Positioner is designed for actuators having a 2-1/4" dimension between the lower face of the stem nut (8D) (refer to page 6) and the positioner mounting flange with the actuator stem in a retracted position.

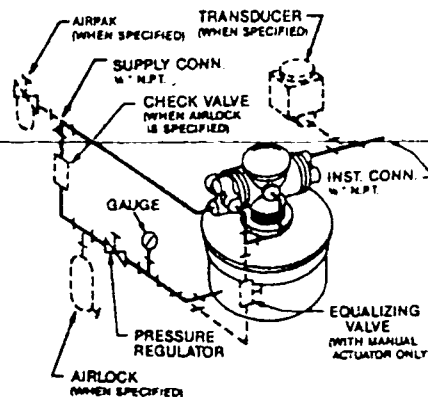
The range spring (8C) is adjusted and set at the factory for the proper range and spring rod (8A) extension as shown on page 6. With the actuator stem in the fully retracted position and the spring rod nut (16) removed from the spring rod (8C), thread the spring nut assembly (8D) onto the actuator stem. Hold the range spring assembly in a vertical position without applying any tension to the range spring (8C). Measure the distance between the positioner mounting surface on the actuator (without gasket) and the top of the spring rod (8A). This distance must be a 2-5/16"  $\pm$  1/64"(58.75 mm  $\pm$  .41 mm) for proper operation of the positioner. If adjustment is necessary, grasp the lower spring clip (8B) and range spring (8C) firmly in one hand. Loosen the upper spring clip (8B) making sure that the lower spring clip is not allowed to turn on the range spring (8A). If the lower spring clip is allowed to turn, the number of inactive coils on the range spring will have to be reset to obtain the proper range. After loosening the upper spring clip (8B), rotate the spring rod (8A) in the direction required to obtain the 2-5/16" (58.75 mm) dimension. Continue holding the lower clip (8B) and range spring (8C) while retightening the upper clip securely. Measure the

2-5/16" (58.75 mm) dimension again to make sure it is correct. Be sure that the actuator stem is fully retracted when making this measurement.

Remove the cap (1) from the positioner and, using a small screwdriver, remove the spirolox ring (3). Pull out the positioner headplate assembly (2) and set it aside. The zero spring (4) should be attached to the headplate assembly. If not, remove it also. Place the gasket (13) and the positioner on the actuator guiding the spring rod (8A) through the hole in the bell crack (17). Install the six 1/4"-20 screws (14) that secure the positioner to the actuator.

Turn the set screw (24) in the spring rod nut (16) such that the head of the screw is flush with the top of the nut as shown. Install this assembly onto the spring rod finger tight. Hold the spring rod nut with a wrench or suitable tool to prevent it from turning and tighten the set screw securely. It is important to make sure that the spring rod nut does not turn while tightening the set screw to maintain calibration of the range spring assembly.

Insert the zero spring (4) onto the headplate and install the headplate assembly (2). Make sure the zero spring (4) is properly centered on the spring rod nut (16) when inserting this assembly. Replace the spirolox ring (3) and the cap (1). Install the necessary piping per the schematic below. Proceed with the zero adjustment procedure outlined previously.



## MODEL GC31

## OPERATING CHECKS

With positioner installed and adjusted in accordance with the preceding instructions, the actuator stem should react to variations in input control signal. By removing the cap (1) and depressing the zero adjust coupling of the headplate assembly (2) while the control signal is applied, step excursions of the stem should take place and the stem should return accurately to its previous position. If the actuator does not appear to function properly, it is advisable to check the following.

## SUPPLY AIR

A regulated - filtered air supply should be used. Check to make sure that the supply pressure and cushion loading pressure, where applicable, are set properly.

\*For positioner removal kit, order 6385266.

**CAUTION:** Before the positioner headplate assembly (2) is removed for inspection, bleed all air from the actuator. Disconnect the supply air and instrument air connections.

## **INSTRUMENT AIR SIGNAL**

Verify that the proper instrument signal is being applied using a pressure gauge or digital pressure readout.

## **YOKE (18) AND BELLCRANK (17) RELATIONSHIP**

Remove the cap (1) and headplate assembly (2) by removing the spirolox ring (3). Inspect the parts visually for proper arrangement and connection. Note carefully that the diaphragms (20) are not twisted. When replacing the headplate assembly, make sure that the zero spring is properly located on the spring rod nut.

## **DISASSEMBLY**

The Commandaire Positioner consists of three main units: the body, the instrument section, and the pilot section.

**Important:** Remove all air supply lines to the positioner before performing any maintenance.

## **BODY SECTION**

After disconnecting all air supply lines, disconnect any remaining tubing connections to the positioner.

To examine the body diaphragms (20) proceed as follows:

### **INSTRUMENT SIDE:**

Remove instrument cap (9) by unscrewing the four fillister head screws. Removal of the instrument cap will free the instrument spring (6), diaphragm assembly (7) and magnet (5) for removal. Remove diaphragm screw (21) and the three flat head screws and lift off spacer (11). Then remove diaphragm plate (19) and diaphragm (20). Inspect the diaphragm for damage and replace if necessary.

### **PILOT SIDE:**

Remove the pilot assembly (26) by unscrewing the four fillister head screws. Use caution when removing the pilot assembly to avoid damage to the exhaust plunger. Remove the exhaust plunger from magnet. Unscrew the three flat head machine screws and lift off spacer (11). Note that the magnet is bonded to diaphragm plate (19) which will not allow removal of diaphragm (20). Visually inspect the diaphragm for damage. If replacement is necessary, refer to "PILOT/INSTRUMENT SECTION".

To replace the yoke (18) or bellcrank (17), first remove the cap (1) and headplate assembly (2). To remove the headplate assembly,

use a small screwdriver to remove the spirolox ring (3), then pull the headplate assembly (2) out of the positioner with the zero spring (4). Note that the spring rod nut (16) must be removed. Refer to Page 2 - "REMOVING POSITIONER FROM ACTUATOR" for this procedure.

Next, rotate the yoke (18) to provide access to the inside stop block (22). Unscrew the two round head screws and remove the stop block. Slide the yoke through the pilot end of the positioner.

The flexure ring assembly (17) is now accessible and may be removed by unscrewing the three round head retaining screws.

## **INSTRUMENT SECTION**

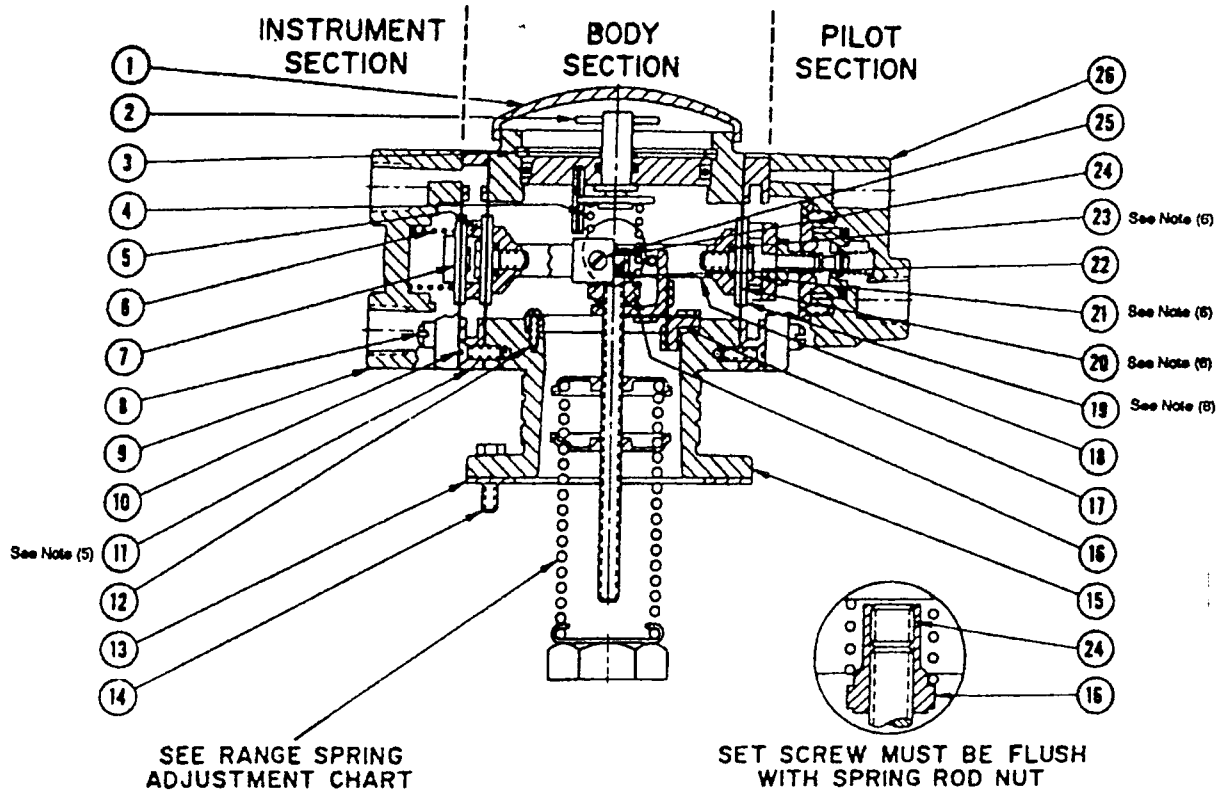
To examine the instrument section only, remove all air supply lines and the piping connections to the instrument section. Proceed as outlined above in "BODY SECTION - INSTRUMENT SIDE". When reassembling the instrument section, be sure the magnet (5) and instrument spring (6) are properly located. Also make sure the diaphragm holes are oriented correctly. The index grooves on the spacer, instrument cap and diaphragm must be in line.

## **PILOT/INSTRUMENT SECTION**

Remove the pilot assembly (26) by unscrewing the four fillister head screws in the pilot assembly. Carefully remove the pilot assembly to avoid damaging the exhaust plunger. Remove the exhaust plunger from the magnet. Check the operation of the exhaust plunger and pilot valve by inserting the exhaust plunger into the center hole inside the pilot assembly. Gently depress the plunger and allow it to return. The plunger should move freely with no binding or sticking. Free movement of the exhaust plunger and pilot valve is essential to proper operation of the positioner. If there is any indication of wear on the end of the exhaust plunger or of the center hole in the pilot assembly, the parts should be replaced.

To replace the diaphragm (20), insert a screwdriver in the center hole of the magnet and pry loose. Once magnet has been removed, loosen and remove diaphragm screw (21) and the three flat head screws, and lift off spacer (11). Then remove diaphragm plate (19) and diaphragm (20). Inspect the diaphragm for damage and replace if necessary.

When reassembling the pilot section, it is recommended that the magnet be bonded to diaphragm plate (19) with Loctite 326 or equivalent. This bonding process will prevent the magnet from shifting during operation or maintenance. Make sure that the magnet is centered on the diaphragm plate and the exhaust plunger is centered on the magnet. With the grooves in the diaphragm, spacer and pilot assembly aligned, carefully guide the pilot assembly over the exhaust plunger. Insert the four fillister head screws and tighten them securely.



Item No.	Description	Qty. Req'd.	Part No.	Item No.	Description	Qty. Req'd.	Part No.
1	Top Cap	1	6025969	14	Hex Hd. Capscrew 1/4" - 20 x 1/4" Lg.	6	6900095
2	Head Plate Assembly	1	6027130	15	Body	1	6026751
3	Spirolox Ring	1	6004691	16	Spring Rod Nut	1	6025803
4	Zero Spring	1	6025811	17	Flexure Ring Assembly (Bellcrank)	1	6025753
5	Magnet	1	6078307	18	Yoke Assembly	1	6026579
6	Instrument Spring	1	6026843	19	Diaphragm Plate	4	6026686
7 <sup>(1)</sup>	Instrument Diaphragm Ass'y	1	6026652	20 <sup>(1)</sup>	Diaphragm	2	6028553
8	Fillister Hd. Mach. Screw #10-32 x 3/4" Lg.	8	6900061	21	Diaphragm Screw	2	6026546
9	Instrument Cap	1	6026801	22	Inside Stop Block	1	6026538
10	Flat Hd. Mach. Screw #8-32 x 1/2" Lg.	6	6900574	23 <sup>(1)</sup>	"O" Ring	2	6076608
11	Spacer	2	6026785	24	Socket Setscrew (Dog Point) 1/4" - 28 x 1/4" Lg.	1	6900113
12	#4 Self Tap Screw x 3/4" Lg. (Slotted Head Type)	3	6900545	25	Round Hd. Mach. Screw #4-40 x 1/2" Lg.	2	6900007
13 <sup>(1)</sup>	Gasket	1	6001782	26	Pilot Assembly	1	6027148

**NOTES:**

- Recommended spare parts can be purchased individually or as a spare parts kit, under number 6385464, Spare Parts Kit GC31 (Consists of items 7, 13, 20 and 23).
- When ordering spare parts, specify complete catalog no., item no. and part no. This will permit positive identification and rapid handling of order.
- For body assembly order 6026504 (Consists of items 10 thru 12 and items 15 thru 25).
- For tapped exhaust use 6026819 for item 9 6027155 for item 26.
- Identical component used in pilot section. Component is not numbered.
- Identical components used in instrument section. Components are not numbered.

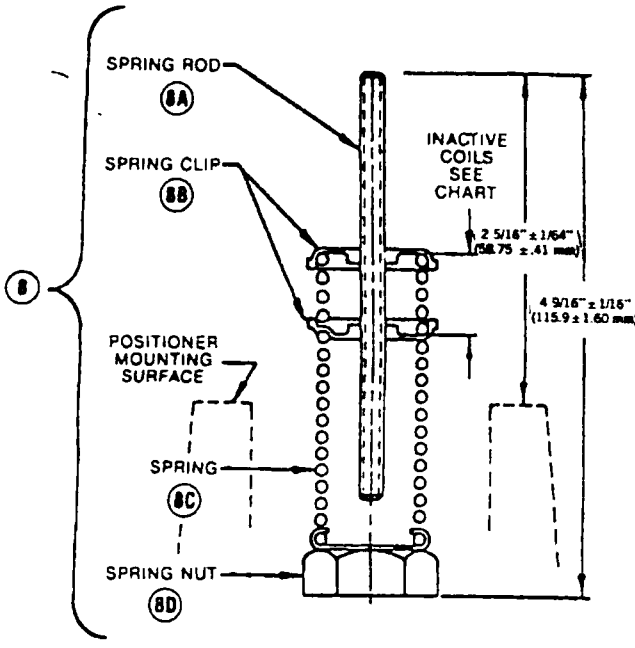


TABLE #1 STEM NUT IDENTIFICATION

STEM NUT ASS'Y NO	THREAD	ACTUATOR	CYLINDER BORE O.D
1	1/2"-24	GB50 1/2" STEM DIA.	3"
2	3/4"-20	GB50 3/4" STEM DIA.	2 1/2"
3	1"-20	GB51	4"
4	1 1/8"-18	GB52	6"
5	1 1/2"-18	GB53	8"
6	2"-14	GB54 GB55	10" 12 1/2"
7	NOT THREADED	—	—

ORDERING INSTRUCTIONS AND RANGE SPRING ASSEMBLY IDENTIFICATION

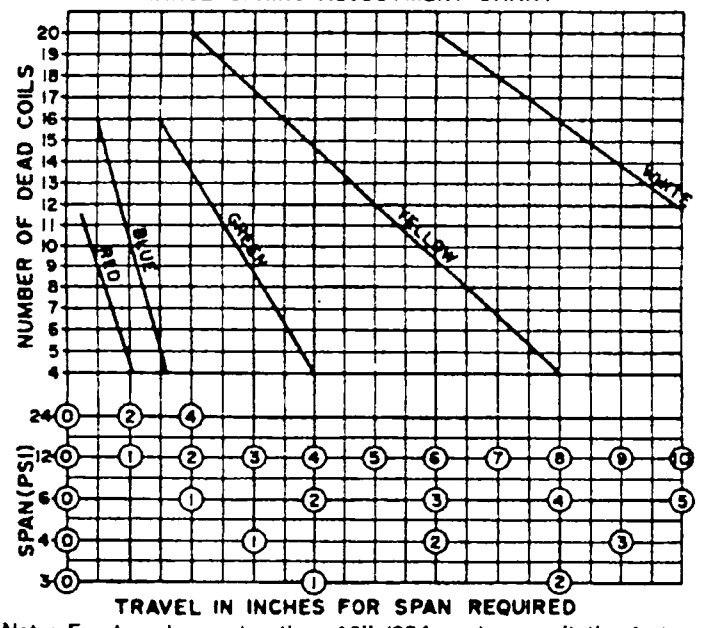
EXAMPLE: Basic No. Stem Nut Ass'y. No. Stroke Length in 1/16" (1.60 mm) Units Specify Spring Color

RANGE SPRING ASSEMBLY: GJ800 5 Y

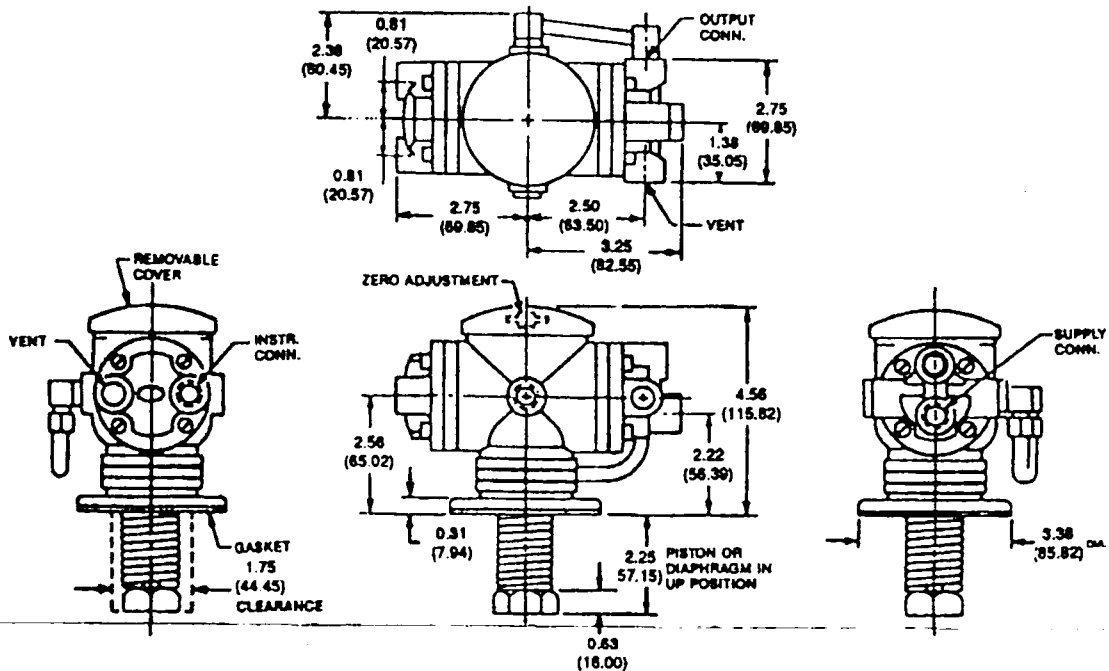
This basic GJ800 Assembly with #5 Stem Nut Assembly (5/8"-18 thread); 6"(152 mm) Stroke: 12 PSI(83 kPa) Instrument Span. A Yellow Range Spring is selected (See Chart below) and lower clip is turned to provide 9.5 inactive coils. Spring Rod Dimension from Positioner Mounting Flange is 2-5/16" ± 1/16" (58.75 ± 1.60 mm).

Refer to manual C-8053 for ordering information.

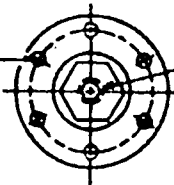
RANGE SPRING ADJUSTMENT CHART



Note: For travels greater than 10" (254 mm), consult the factory.



SIX 0.28 (7.11) HOLES ON 2.81 (71.37) B.C.  
 # - 1/8" - 30 MC. HEX. HD. CAPSCREW X  
 1/2" LG.



THIS TAPPING IS DETERMINED BY SIZE OF CONO-FLOW CYLINDER OR MUST BE SPECIFIED BY CUSTOMER.

**NOTES:**

1. ALL CONNECTIONS ARE 1/4" N.P.T. UNLESS OTHERWISE NOTED.
2. WHEN ORDERING, SPECIFY MODEL, RANGE AND STROKE.
3. FOR PIPING SCHEMATICS SEE A50-48.
4. VENTS CAN BE TAPPED 1/4" N.P.T. FOR GAS SERVICE.
5. ( ) DIMENSIONS IN MILLIMETERS.

**Conoflow**

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A SUBSTANCE WHICH HARMS PUBLIC HEALTH AND  
ENVIRONMENT BY DESTROYING OZONE IN THE UP-  
PER ATMOSPHERE.