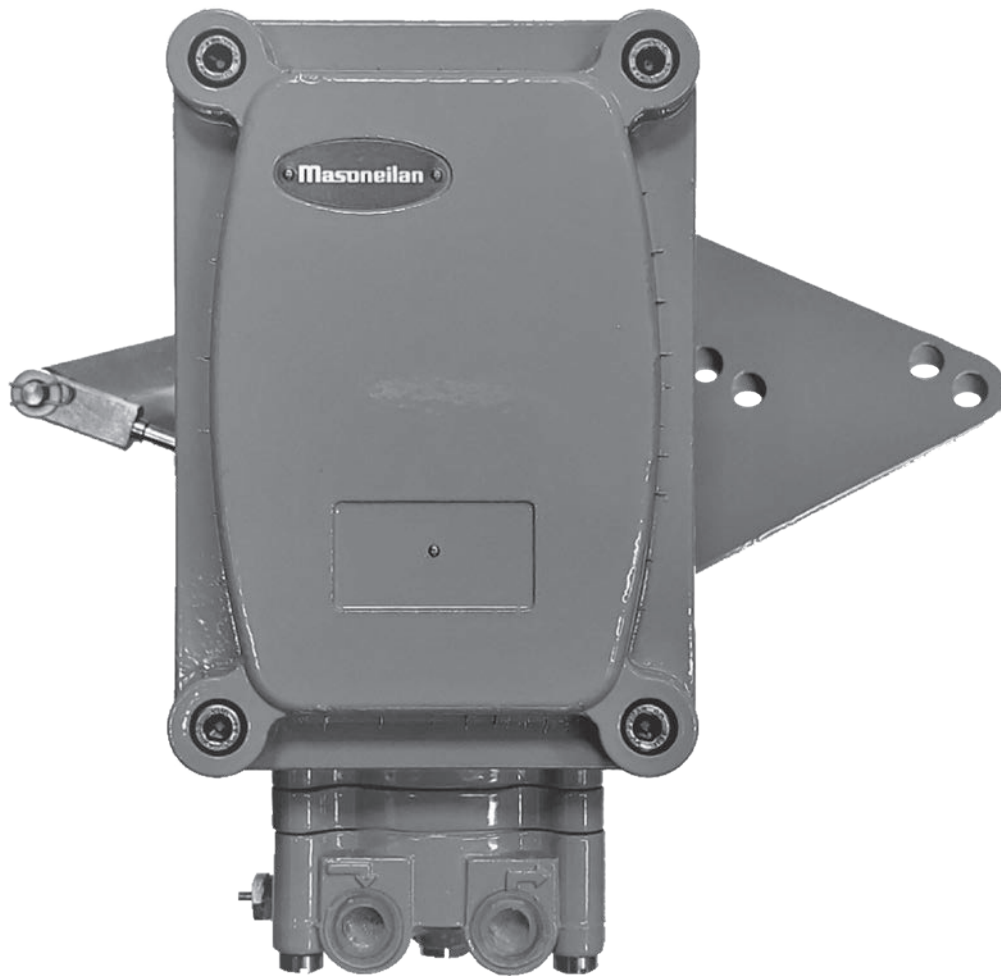


## Model 8013 Series Electro-Pneumatic Positioner

Instruction Manual (Rev. B)



THESE INSTRUCTIONS PROVIDE THE CUSTOMER/OPERATOR WITH IMPORTANT PROJECT-SPECIFIC REFERENCE INFORMATION IN ADDITION TO THE CUSTOMER/OPERATOR'S NORMAL OPERATION AND MAINTENANCE PROCEDURES. SINCE OPERATION AND MAINTENANCE PHILOSOPHIES VARY, BAKER HUGHES AND ITS SUBSIDIARIES AND AFFILIATES) DOES NOT ATTEMPT TO DICTATE SPECIFIC PROCEDURES, BUT TO PROVIDE BASIC LIMITATIONS AND REQUIREMENTS CREATED BY THE TYPE OF EQUIPMENT PROVIDED.

THESE INSTRUCTIONS ASSUME THAT OPERATORS ALREADY HAVE A GENERAL UNDERSTANDING OF THE REQUIREMENTS FOR SAFE OPERATION OF MECHANICAL AND ELECTRICAL EQUIPMENT IN POTENTIALLY HAZARDOUS ENVIRONMENTS. THEREFORE, THESE INSTRUCTIONS SHOULD BE INTERPRETED AND APPLIED IN CONJUNCTION WITH THE SAFETY RULES AND REGULATIONS APPLICABLE AT THE SITE AND THE PARTICULAR REQUIREMENTS FOR OPERATION OF OTHER EQUIPMENT AT THE SITE.

THESE INSTRUCTIONS DO NOT PURPORT TO COVER ALL DETAILS OR VARIATIONS IN EQUIPMENT NOR TO PROVIDE FOR EVERY POSSIBLE CONTINGENCY TO BE MET IN CONNECTION WITH INSTALLATION, OPERATION OR MAINTENANCE. SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY FOR THE CUSTOMER/OPERATOR'S PURPOSES THE MATTER SHOULD BE REFERRED TO BAKER HUGHES.

THE RIGHTS, OBLIGATIONS AND LIABILITIES OF BAKER HUGHES AND THE CUSTOMER/OPERATOR ARE STRICTLY LIMITED TO THOSE EXPRESSLY PROVIDED IN THE CONTRACT RELATING TO THE SUPPLY OF THE EQUIPMENT. NO ADDITIONAL REPRESENTATIONS OR WARRANTIES BY BAKER HUGHES REGARDING THE EQUIPMENT OR ITS USE ARE GIVEN OR IMPLIED BY THE ISSUE OF THESE INSTRUCTIONS.

THESE INSTRUCTIONS ARE FURNISHED TO THE CUSTOMER/OPERATOR SOLELY TO ASSIST IN THE INSTALLATION, TESTING, OPERATION, AND/OR MAINTENANCE OF THE EQUIPMENT DESCRIBED. THIS DOCUMENT SHALL NOT BE REPRODUCED IN WHOLE OR IN PART TO ANY THIRD PARTY WITHOUT THE WRITTEN APPROVAL OF BAKER HUGHES.

# Table of Contents

<b>About this Manual</b> .....	<b>4</b>
<b>Warranty</b> .....	<b>4</b>
<b>Copyright</b> .....	<b>4</b>
<b>Safety Information</b> .....	<b>5</b>
<b>Preliminary Stops</b> .....	<b>6</b>
<b>Installation</b> .....	<b>8-10</b>
<b>Calibration and Maintenance</b> .....	<b>10-13</b>
<b>Troubleshooting</b> .....	<b>13-14</b>
<b>Appendix A - With cam mounted on linear valves equipped with 37/38 or 87/88 type actuator</b> .....	<b>15</b>
Positioner Mounting and Calibration .....	16
<b>Appendix B - Without cam mounted on linear valves equipped with 37/38 or 87/88 type actuator</b> .....	<b>18</b>
Positioner Mounting and Calibration .....	18
Nozzle .....	19
<b>Appendix C - Mounted on 28000 Series linear VariPak valves</b> .....	<b>20</b>
Positioner Mounting and Calibration .....	20
Fastening .....	21
Calibration .....	21
Case of positioner equipped with a linear cam.....	22
Case of positioner with equal percentage cam .....	23
<b>Appendix D - Mounted on 35002 Series Camflex and 30000 Series Varimax control valves</b> .....	<b>24</b>
Positioner Mounting, Cam Orientation and Calibration .....	24
Calibration .....	25-26
Nozzle .....	27
<b>Appendix E - Mounted on 37002 Series MiniTork II valves</b> .....	<b>28</b>
Positioner Mounting, Cam Orientation and Calibration .....	28
Calibration .....	29
Nozzle .....	31

# About this Manual

- The information in this manual is subject to change without prior notice.
- The information contained in this manual, in whole or part, shall not be transcribed or copied without Baker Hughes's written permission.
- Please report any errors or questions about the information in this manual to your local supplier.
- These instructions are written specifically for the 8013 Electro-Pneumatic positioner, and do not apply for other device outside of this product line.

## Warranty

Items sold by Baker Hughes are warranted to be free from defects in materials and workmanship for a period of one year from the date of shipment provided said items are used according to Baker Hughes recommended usages. Baker Hughes reserves the right to discontinue manufacture of any product or change product materials, design or specifications without notice.

### **Note: Prior to installation**

- ***The positioner must be installed, put into service and maintained by qualified and competent professionals who have undergone suitable training.***
- ***All surrounding pipe lines must be thoroughly flushed to ensure all entrained debris has been removed from the system.***
- ***Under certain operating conditions, the use of damaged equipment could cause a degradation of the performance of the system which may lead to personal injury or death.***
- ***Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.***

## Copyright

The complete design and manufacture are the intellectual property of Baker Hughes.

# Safety Information

## Important – Please Read Before Installation

These Instructions contain **DANGER**, **WARNING**, and **CAUTION** labels, where necessary, to alert you to safety related or other important information. Read the instructions carefully before installing and maintaining your instrument(s). **DANGER** and **WARNING** hazards are related to personal injury. **CAUTION** hazards involve equipment or property damage. Operation of damaged equipment can, under certain operational conditions, result in degraded process system performance that can lead to injury or death. Total compliance with all **DANGER**, **WARNING**, and **CAUTION** notices is required for safe operation.



This is the safety alert symbol. It alerts you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



When used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, could result in property damage.

**Note: Indicates important facts and conditions.**

# Preliminary Stops

1. Unpack carefully.
2. Read instructions before installation. These instructions concern only general characteristics and procedures applied to the 8013 Series positioners. The particularities of various configurations are given in appendices.
3. Record the serial number for future reference.
4. The positioner is fitted with a powerful magnet; do not bring close to it a watch or an instrument likely to deviate under the influence of a magnetic field.

## Introduction

**Note: These instructions apply to installation, adjustments, calibration and possible repair of 8013 series positioners mounted on various valves.**

This version of positioner can be manufactured to meet the requirements of each standard pertaining to:

- protection against explosion for equipment intended to be installed in the hazardous atmosphere;
- protection against dust and water splash for tight equipment;
- sometimes a combination of the two preceding protections.

The instructions pertaining to these standards as well as to electrical characteristics of the positioner are further explained in the Model 8000 ATEX Instruction Manual. Therefore, the operator should always get in hands the Model 8000 ATEX Instructions.



**Before any operation on the positioner, refer to Model 8000 ATEX Instruction Manual Ref. 33467.**

This equipment should not be installed, serviced up or put into operation without having read and fully understood beforehand the instructions contained in this manual and in ATEX Instructions. Moreover, before initiating any operation on this positioner, the following should be read:

- operating instructions pertaining particularly to the installation;
- safety rules listed on the instruction plate attached to the cover of the device in some cases (positioners with explosion-proof housing).



**Non-compliance with these rules may cause faulty functioning of the device, perturb with the installation functioning or seriously damage it.**

**In addition, such negligence might expose operating personnel present on the site to serious hazards.**

## Service

Baker Hughes has a highly skilled After Sales Department available for start-up, maintenance or repair of our equipment. Contact the nearest Baker Hughes Sales Office or the After Sales Department.

## Spare Parts

When performing maintenance, always use **Masoneilan™** replacement parts. Parts are obtainable through your local Baker Hughes Representative or Sales office. When ordering parts, always provide Model and Serial Numbers shown on serial plate.

## Training

Baker Hughes regularly holds training programs to train customer service and instrumentation personnel in the operation, maintenance and application of our control valves and instruments. To participate in one of these training sessions, contact your local Baker Hughes Representative.

# Description and Operation

## General

The 8013 Series Positioner is an electro-pneumatic force-balance device which provides precise means to obtain at any time pneumatic control valve plug theoretical position corresponding to a given DC current input signal.

In addition, the positioner provides convenient means of split-range operation for several (usually two) valves from a single signal emitted by a single controller.

The positioner may have either direct or reverse action on either direct or reverse action equipment connected.

In force-balanced state any variation of the electrical signal going through the coil determines a movement of the flapper in front of the nozzle inlet. This movement produces a variation in the nozzle back pressure affecting the positioner output pressure controlled by the relay.

There are two possible configurations: with or without cam.

## Positioner with cam

The feedback arrangement of this positioner may be fitted with a cam which can be of different type. This cam permits the valve to present the different flow characteristics: linear, split-ranging linear, equal percentage. The characteristic can be modified by replacement of the cam or by modifying its position on its axle.

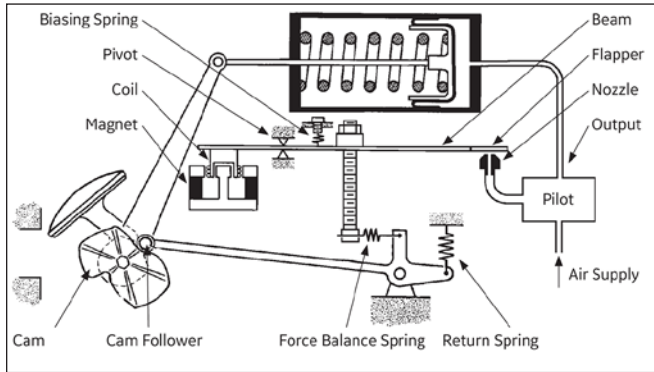


Figure 1 - Diagram of operation (example of the positioner with cam mounted on rotary valve)

Positioner without cam/linear only

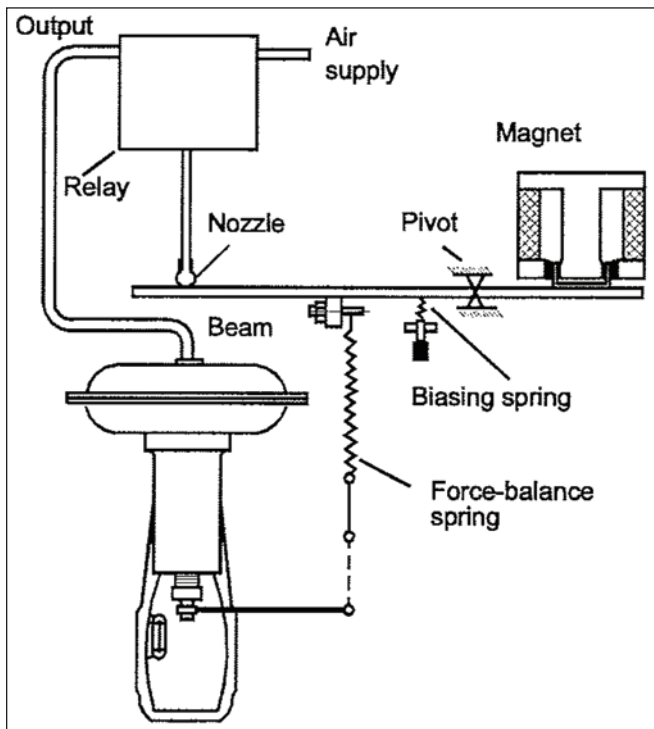


Figure 2 - Diagram of operation (example of the positioner without cam mounted on linear valve)

## Operation

In force-balanced state, any variation of the electrical controller signal going through the coil determines a movement of the flapper in front of the nozzle inlet. This movement produces a variation in nozzle back pressure affecting positioner output pressure controlled by the relay. This pressure variation changes the position of the driving axle of equipment connected (i.e. actuator).

This position modification is transmitted (by lever or cam) to the force-balance spring. The modification of the spring tension tends to counteract the displacement of the beam under the action of a variation of the electrical signal going through the coil until the balance of the flapper will be obtained. At that time the output pressure of the relay is stabilized.

As soon as the balance is obtained, theoretically there are no pressure variations in the relay. Nevertheless, its sensibility is increased by means of a light leakage arranged between input and output. This leakage contributes to accelerate the response of the device. The positioner can operate either by direct action or reverse action.

## Direct action

With direct positioner action, an increase in the input signal produces a force on the beam moving the flapper to cover the nozzle. The resulting increase in nozzle back pressure increases positioner output pressure to the actuator.

The resulting actuator stem motion is transmitted to the force-balance spring, extending the spring until the force exerted on the beam balances the opposing force of the coil.

At this last phase, the motion of the beam moves the flapper away from the nozzle and nozzle back pressure decreases. The system then is balanced and positioner output pressure is stabilized at an amount necessary to maintain the control valve plug in the desired position corresponding to the input signal value.

## Reverse action

With reverse positioner, an increase in the input signal produces a decrease in output pressure.

## Changing of positioner action

In order to change the positioner action proceed as follows:

- Consult the ATEX Instruction Manual.
- Reverse the position of the coil leads on the terminal board (see ATEX Instruction Manual).



- In some cases, replace the coil by another one corresponding to the new action (see ATEX Instruction Manual).

**⚠ WARNING**

**In case of explosion-proof housing device, the positioner case must not be opened when the device is energized.**

- In some cases, reverse the force-balance spring position in regard to the beam (see Changing the force-balance spring position” on page 9).
- Calibrate after changing of action (see Calibration on page 10).

### Split-range operation

Split-ranging permits the operation of two (even three) standard valves in sequence from one control instrument signal. The total actuator stroking of each valve occurs with one half or one third of the signal.

The following instructions apply only when the positioners are mounted according to the following diagrams: connection in series (see Figure 4) or in parallel (see Figure 5).

The total circuit resistance of positioner mounted for split range operation should be in accordance with maximum admitted load of a controller used.

The choice of the connection type (in series or in parallel) as well as of characteristics of positioners depends on the signal and impedance of the circuits.

On request, Baker Hughes supplies the data required for selection of the equipment or for its modification in the field.

The table below shows, as an example, the plug positions of two air-to-close split-ranging valves with a given signal for different configurations.

Controller Output Signal	Plug position for the first valve	Plug position for the second valve
4mA	Full open	Full open
8mA	Half open	Full open
12mA	Closed	Full open
16mA	Closed	Half open
20mA	Closed	Closed

Figure 3 - Plug positions

### Serial connecting

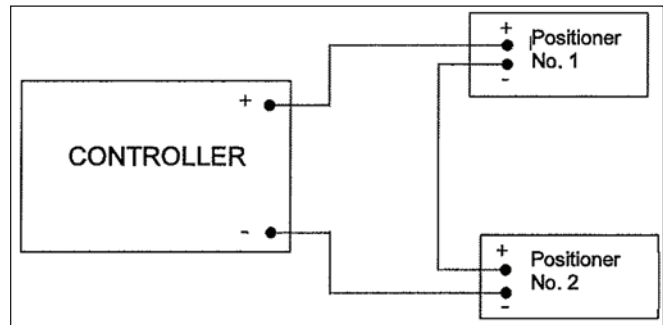


Figure 4 - Serial connecting

In this configuration, the total resistance of the circuit is twice more than that of the positioner.

#### Positioners used with linear valves

In order to connect the positioners installed on the linear valves with or without cam, it is necessary to use a force balance spring developing a force equal to the half of that developed by a standard spring.

#### Positioner used with rotative valves

The positioners can be modified in the field in order to provide the split-range operation of two rotative valves by selecting a corresponding lobe of the cam. In this case, the device uses a force-balance spring with force equal to that of the standard spring.

### Parallel connecting

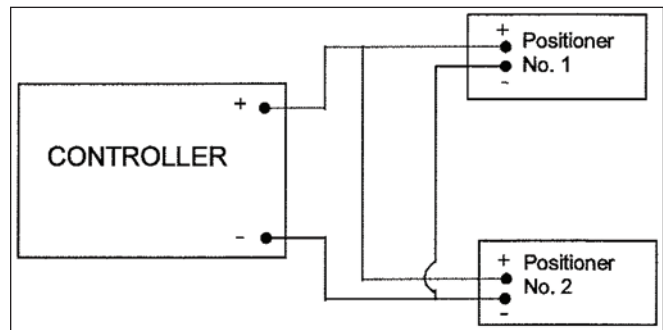


Figure 5 - Parallel connecting

In this case, the total resistance of the circuit is equal to half of that of the positioner. The force-balance spring used in this case develops a force equal to the half of that developed by a standard spring



# Installation

## Installation site

**Note:** Before any operation on the positioner see the ATEX Instruction Manual.



## CAUTION

**De energize electrical and pneumatic circuits before any servicing or maintenance.**

**Ensure that connections are correctly performed and that the cover is well placed on the case before energizing the circuits. Only qualified personnel can service this equipment .**

- When installing the positioner, avoid locations which are subject to wide ambient temperature variations.
- If control valve can be subject to sub-freezing temperature, special provisions must be made for drying positioner air supply.
- If possible, avoid locations where vibrations occur.
- Do not install the positioner near equipment sensitive to the magnetic field.

For more detailed information, refer to ATEX Instruction Manual.

## Checking

Before installing the positioner, the following should be checked depending on the configuration used:

- Proper mounting of the cam and rear lever S/A (see appendices for positioner with cam).
- Correct position of the force-balance spring (for direct or reverse action, see “Force-balance spring position” in next column).
- Proper nozzle number stamped on its body. This number depends on the nominal diameter of the valve or the actuator and the air supply pressure.
- See in appendices a summary table which contains the nozzle numbers suitable for each application.
- The coil S/A and terminal board S/A: their characteristics must correspond to those of the input signal (see ATEX Instruction Manual).

## Force-balance spring position

The force-balance spring is a preponderant component of the feedback arrangement. Depending on the action type of positioner, it can be mounted:

- below the beam in case of direct action;
- above the beam in case of reverse action.

To change the force-balance spring position, the operations indicated in paragraph 2.3.1 should be performed.

## Changing the force-balance spring position (Figure 6)

In order to change the force-balance spring position, proceed as follows:

- Remove the cover and disconnect (or unsolder) the leads of the coil from the terminal board.
- Disengage the force-balance spring (8) from the adjusting screw (6).
- Unscrew the nuts (11) and remove the hooking screw (12).
- Reinsert the screw (12) in the corresponding hole (A or B) of the inner lever (10).



## WARNING

**The hole used to hook the spring and drilled in the screw head must be perpendicular to the bottom of the case.**

- Adjust the hooking screw (12) on the inner lever (10) up to approximately half of its total length. Tighten two nuts (11) and hook the force-balance spring.
- Loosen the nut (7) and remove adjusting screw (6). Then screw it to the corresponding side of the beam. Replace the nut (7).



## WARNING

**In any case, be careful to have the nut (7) always placed on top of the beam for easy reaching.**

- Replace the entire operation mechanism into the case without tightening its mounting screws (4). Position the entire operating mechanism in a way to center the flapper (46) above the nozzle (16) inlet. Tighten the screws (4).

- Connect (or soft-solder) the leads of the coil to the terminal board and couple the force-balance spring (8) with the adjusting screw (6). Close the cover.

*from each other. Nevertheless, the mount rational orientation for this type of adaptation is the one when the connections are situated toward the back side.*

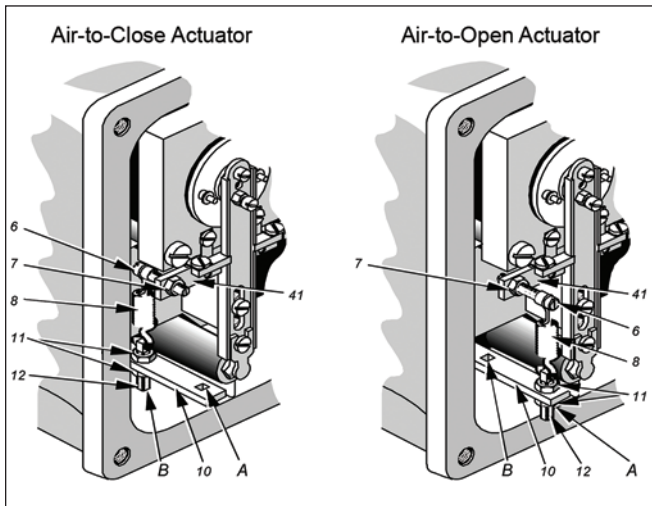


Figure 6 - Changing the force-balance spring position

In order to change the relay orientation, proceed as follows:

- Shut off the air supply.
- Remove the mounting screws.
- Turn the connections into the required position.
- Replace and tighten the mounting screws.
- Switch on the air supply.

## Mounting of the case

For procedure of the case mounting depending on the configuration selected, see the appendices.

## Electrical circuit

See ATEX Instruction Manual.

## Pneumatic circuit

The positioner supply and output connections are tapped 1/4" NPT. They are located on the relay and marked with arrows.

## Calibration

Masoneilan 8013 Series positioners are factory mounted and calibrated according to the order specifications. However, it is mandatory to perform a calibration in the following cases:

- If positioner is separately supplied.
- If action was changed.
- If positioner is reinstalled on an actuator.
- If some of the electrical and/or mechanical components were replaced.

### Supply circuit

The use of the 78-4 or 78-40 model air filter-regulator is recommended on the supply circuit. Ensure that its mounting position is correct (drain-cock and drip-well downward).

The calibration procedure is being specific for each configuration, see the appendices.

## Maintenance

For the air supply of the filter-regulator, use the tube of 6 X 8mm.

The supply connection of the 78-4 or 78-40 model filter-regulator is tapped 1/4" NPT.

Adjust the output pressure of the air filter-regulator to the value indicated on the serial plate of the valve.

Maximum admissible pressure values for the positioner air supply are in accordance with characteristics of the valve, an action type selected (direct or reverse) and a loss of head in the circuit.

### Output circuit

The pneumatic output connection to the actuator should be particularly tight.

### Relay orientation

**Note: the relay can be mounted on the positioner in one of the four different positions shifted at 90°**

## ! WARNING

**De energize electrical and pneumatic circuits before any servicing or maintenance.**

**Ensure that connections are correctly performed and that the cover is well placed on the case before energizing the circuits. Only qualified personnel can service this equipment .**

## Metering tube (Figure 7)

The metering tube provides the passage for the air supply to the nozzle circuit.

A push button with a small wire permits to clean out the jewel orifice, if necessary. The metering tube assembly can be removed without relay disassembly.

## Relay (Figure 7)

In case of relay failure, disassemble it in order to clean it or replace the damaged parts.

### Relay Disassembly

- Disconnect air tubing.
- Unscrew the screw which fastens relay to the positioner body and remove relay.
- Remove metering tube, holding screw with its gasket, relay plug and its spring.
- Remove mounting screws, diaphragm S/A, bellofram plate, gasket and diaphragm spring.
- Clean out parts with a clean soft cloth. Use solvent if oil or grease traces are present (do not use solvent on diaphragm and gaskets).
- Blow out the inlets and tubes with compressed air.
- Replace all damaged parts.

### Relay Reassembly

- Insert two mounting screws into two holes in the cap shifted to 180° from each other.
- Replace successively diaphragm S/A, bellofram plate S/A and new gasket.
- Place this assembly on the relay body after introducing the diaphragm spring in it. Provide correct mounting and centering of all components (the assembly is facilitated due to the mark on each part). Insert the other four mounting screws and tighten all the six screws.
- Insert relay plug with its spring in the relay body. Insert and tighten holding screw equipped with a new gasket.

- Replace metering tube.

- Mount the relay on the positioner in the position facilitating connections. Insert and tighten mounting screws.

## Nozzle (Figure 8)

In order to clean nozzle (16), proceed as follows.

### Nozzle Disassembly

- Ensure that the electrical and pneumatic circuits are de-energized.
- Remove the screw (45) and the flapper (46) from the beam (41).
- Unscrew and remove the nozzle (16) from the case (14).
- Clean the nozzle with a solvent and soft cloth.
- Blow out the inlet with the compressed air.

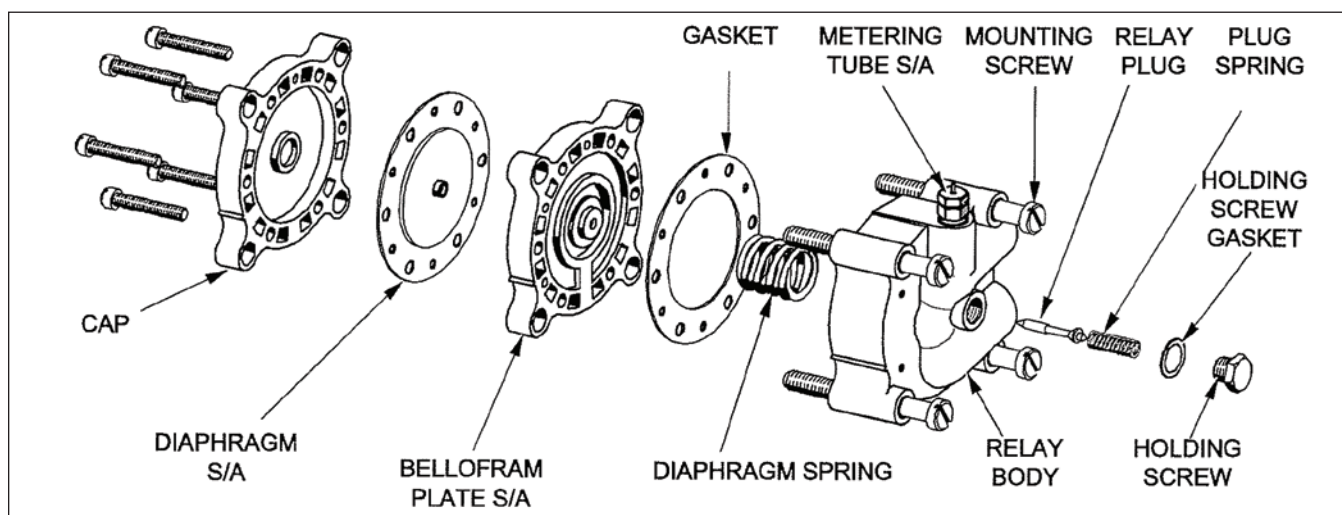


Figure 7 - Relay

## Nozzle Reassembly

- Replace the nozzle (16) on the case (14).

### **! WARNING**

**When changing the nozzle, be sure that the number stamped on its body corresponds to the configuration characteristics (see appendices).**

- Replace the flapper (46) on the beam (41) and fasten it with screws (45).

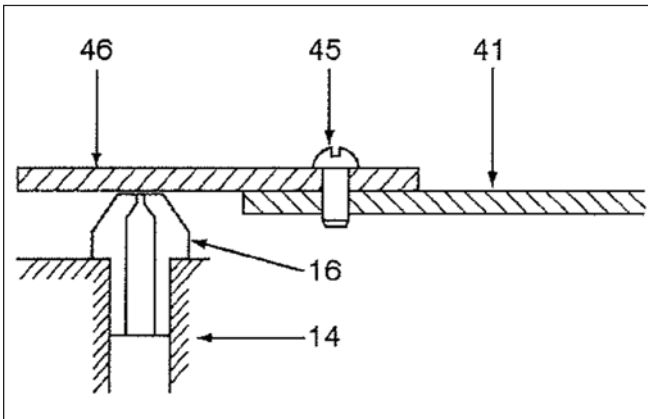


Figure 8 - Nozzle

## Flexure strips replacement (Figure 9)

- Ensure that electrical and pneumatic circuits are de-energized.
- Remove positioner cover and disconnect electrical input and air supply. Remove positioner from the actuator.
- Disconnect coil leads from the terminal board.
- Disengage the force-balance spring from the end of its adjusting screw.
- Remove two screws (4) and lift the entire operating mechanism from the case.
- Remove screws (42) and flexure strips (49 and 50) from the beam. Replace coil if necessary according to instructions of the paragraph titled Coil Replacement.
- Replace damaged flexure strips and reattach beam to the magnet with new flexure strips and screws (42). Do not tighten screws. Align the beam according to instructions of the paragraph titled Beam Alignment.

## Coil replacement (Figure 9)

Remove the entire operating mechanism (see paragraph titled Flexure Strips Replacement). Remove screws (44 and 45) in order to detach the coil (40) from the beam.

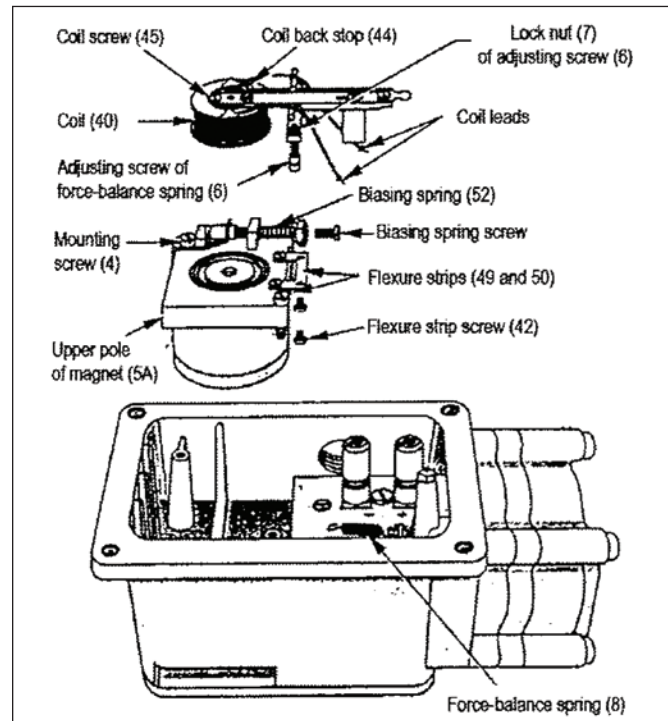


Figure 9 - Replacement of flexure strips and the coil

**Note: Coil stop screw (44) should not extend into the coil winding.**

- Attach replacement coil loosely to the beam with screws (44 and 45).
- Reattach beam to magnet with flexure strips and screws, then align the beam as indicated in the paragraph titled Beam Alignment.

## Beam alignment (Figure 10)

- Insert 1/8" (3,175 mm) diameter rod into alignment holes of the coil, beam and magnet, and then place on the magnet, between beam and coil, the wedge (3,97 mm) high, not wider than 1 mm. Rod and wedge material should be nonmagnetic.
- Tighten two lower screws (42) of inner flexure strip to the beam as well as two lower screws of outer flexure strip to the magnet.
- Replace the entire operating mechanism in case. Position the biasing spring bracket (39) in place and fasten it with two screws (4).
- Exert downward pressure on the beam between wedge 5/32" high and nozzle. Tighten four remaining screws of flexure strips (42).

- Tighten the coil screw (45) and remove the alignment rod and wedge.
- Adjust coil stop screw (44) so that flapper travel in front of the nozzle inlet will be equal to 0.8 mm (1/32") approximately. Tighten the locknut of the stop (43).
- Engage force-balance spring (8) into its adjusting screw (6) and reattach biasing spring (52) to the beam with the screw.
- Connect coil leads to the terminal board according to the positioner action required.
- Replace the cover after calibration.

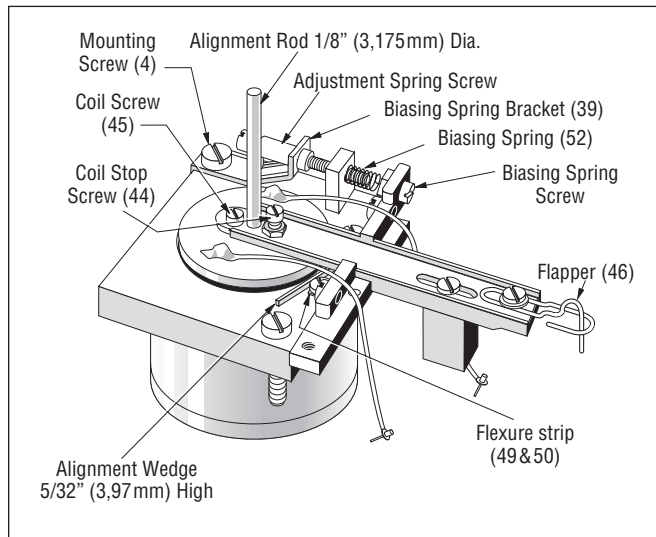


Figure 10 - Beam alignment

## Circuit board replacement

If it becomes necessary to change the input signal range of a positioner, a terminal board and a coil adapted to accommodate the new signal should be installed. These parts should be ordered from our Spare Parts Department.

In order to change terminal board, proceed as follows:

- Remove the operating mechanism assembly from case as described in the paragraph "Replacement of fixture strips". Disconnect input signal leads from terminal board.
- Unscrew two screws holding the terminal board to case.
- Install the replacement terminal board and fasten it securely to case.
- Insert the operating mechanism assembly in case, then install biasing spring bracket (39) and tighten two screws (4). Connect input signal leads.
- Engage the force-balance spring (8) into its adjusting screw (5).

- Connect coil leads to terminal board according to positioner action required. Replace the cover after calibration.

## Troubleshooting

The following conditions should be met for trouble-free operation:

- Pneumatic and electrical connections properly realized;
- Proper connection of coil and input signal leads to the terminal board;
- Proper supply pressure;
- Controller signal and input impedance adapted to accommodate the controller used. It may be necessary to take into account a line resistance (see ATEX Instruction Manual);
- Coil stop screw adjusted to allow approximately 0.8 mm (1/32") flapper travel in front of the nozzle inlet;
- Proper size nozzle: a nozzle number is stamped on its body;
- All operating mechanism components fastened firmly as required.
- Proper positoner fastening on the valve.
- Proper cam mounting (in case of positioners with cam);
- Proper greasing of the cam axis (80) in case of positioners with cam;
- Proper force-balance spring (8) position.

## Air circuit

In the event of faulty operation of the positioner, where the cause is not really apparent, check air system as follows:

- Exert sufficient force on the flapper to cover the nozzle inlet. Valve plug should travel its full stroke.
- If response is other than indicated above, push clean-out plunger of metering tube. Inspect for plugged nozzle. Check to see whether the metering tube is properly seated in the relay body. If difficulty persists, disassemble and clean relay.



## Electrical circuit

**Note:** For all operation on the positioner, refer to *ATEX Instruction Manual*.

After checking air circuit, the electrical circuit should be checked with an ohmmeter as follows:

- Disconnect controller signal leads from terminal board;
- Connect ohmmeter leads to positioner terminal posts. Check to see whether the circuit resistance is corresponding to the rated value indicated on the serial plate. See ATEX Instruction Manual for values of the rated resistance for all main circuits;
- Disconnect coil lead from positive terminal and connect it to one of the ohmmeter inputs. Connect other ohmmeter input to negative terminal. Coil resistance value should approximate the rated resistance indicated in ATEX Instruction Manual;
- If coil resistance is correct but total positioner circuit resistance is not, then repair or replace terminal board. If coil resistance is not yet correct, replace the coil;
- Disconnect ohmmeter lead from negative terminal and connect it to the stop screw in order to measure a coil insulation resistance;
- Replace coil if ohmmeter indicates a value other than a very high resistance (practically infinite).

# Appendix A

## 8013 series positioner with cam mounted on linear valves equipped with 37/38 or 87/88 type actuator

### Description

This positioner operates in the same way as described in the general sections. It is mounted on linear valves equipped with an actuator.

### Position and mounting of feedback elements

The feedback device of the positioner is fitted with force balance spring (8), rear lever (261) and cam (87) with two lobes permitting the valve to present linear or equal percentage flow characteristic. In order to modify the characteristic, the position of cam on its axis should be changed.

### Position of cam (87) and rear lever (261)

The cam and rear lever form a subassembly which pivots around an integrated bearing post (80) located at the back of the case.

- The rear lever (261) is always mounted on the left of the positioner when this one is seen from the rear (see figures A5 and A7).
- The mark (LIN or PERC) which appears on the visible side of the cam (87) when it is mounted must correspond to the chosen flow characteristic (linear or

equal percentage). This mark must also indicate the rotation axis of the cam (see figures A1, A5, and A7).

If one of these conditions is not met, proceed as follows:

- Remove retaining clip (91) and disengage cam (87) - rear lever (261) assembly from the bearing post (80). Unscrew the nut (90) and disassemble cam and rear lever.

**Note: Apply a little bit of grease on the bearing post (80).**

- Reassemble cam and rear lever in the proper position and tighten firmly the nut (90). Replace this subassembly on bearing post (80) being careful to place correctly the bearing lever (82) relating to the cam (87) and the external lever (32). Replace the retaining clip (91) (see figures A1, A4, A5, and A7).

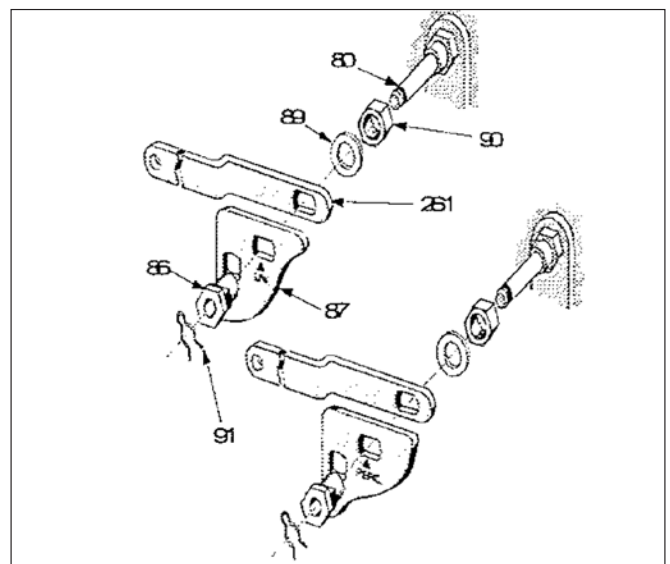


Figure A1 - Mounting cam - rear lever S/A

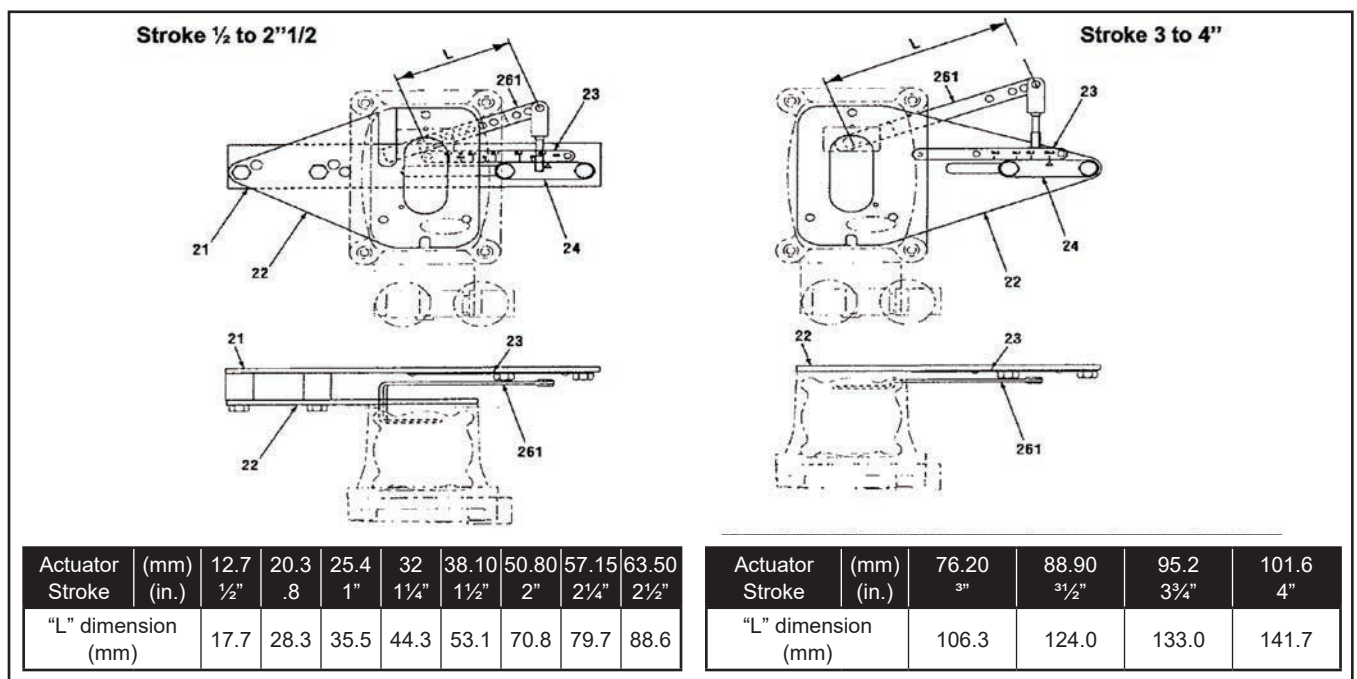


Figure A2 - Adaptation possibilities by means of bracket (22) and rear lever (261) (front view)



# Positioner Mounting and Calibration

## Mounting of the positioner with cam

(see figures A2, A3, and A4)

### For 37/38 and 87/88 type actuator (with strokes 1/2" to 2"1/2)

8013 series positioner is fastened to the actuator by means of two mounting brackets (21 and 22) linked together (mounting bracket (21) is fastened to the actuator, and mounting bracket (22) to the positioner).

The position of 8013 positioner on these brackets is always the same whatever the stroke.

In order to position correctly 8013 positioner on the actuator, the stroke indicator (23) located on the bracket (21) must be adjusted according to the rear lever (261) strokes.

The rear lever end (261) provided for turnbuckle (263) should then be located as near as possible to the actuator axis indicated with the triangle on the index (24).

### For 37/38 type actuator (with strokes 3" and 4")

8013 series positioner is fastened to the actuator by means of mounting bracket (22).

The position of 8013 positioner on this bracket (22) is always the same whatever the stroke.

In order to position correctly 8013 positioner on the actuator, the stroke indicator (23) located on the bracket (22) must be adjusted according to the rear lever (261) strokes.

The rear lever end (261) provided for turnbuckle (263) should then be located as near as possible to the actuator axis indicated with the triangle on the index (24).

## Linkage accessories (Figure A3)

They include clevis (262), turnbuckle (263), turnbuckle screw (265), transmission rod (266) and locknut (264).

The turnbuckle and turnbuckle screw provide an adjustable link between the transmission rod and clevis pivoted on the positioner rear lever.

**Note: The transmission rod take-off clamps must be attached to the actuator stem at the point permitting the full actuator stem travel.**

- Adapt clevis (262) on the rear lever end (261) by means of clevis pin (253), washer (254) and retaining clip (255).
- Screw turnbuckle screw (265) on the threaded end of transmission rod (266) and rotate it until it aligns with the clevis (rotation plane of rear lever).
- Fully screw nut (264) on turnbuckle screw (265).
- Connect clevis (262) to the turnbuckle screw (265) by means of turnbuckle by screwing them approximately on the same length.

**Note: The lower end of the turnbuckle hex has been machined round in order to identify the right hand thread.**

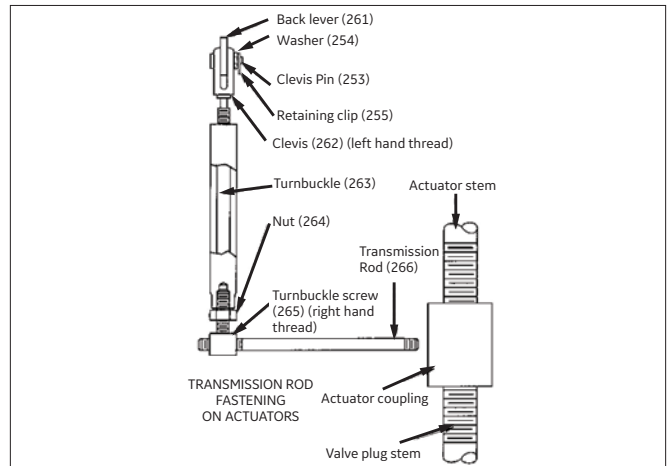


Figure A3 - Linkage accessories

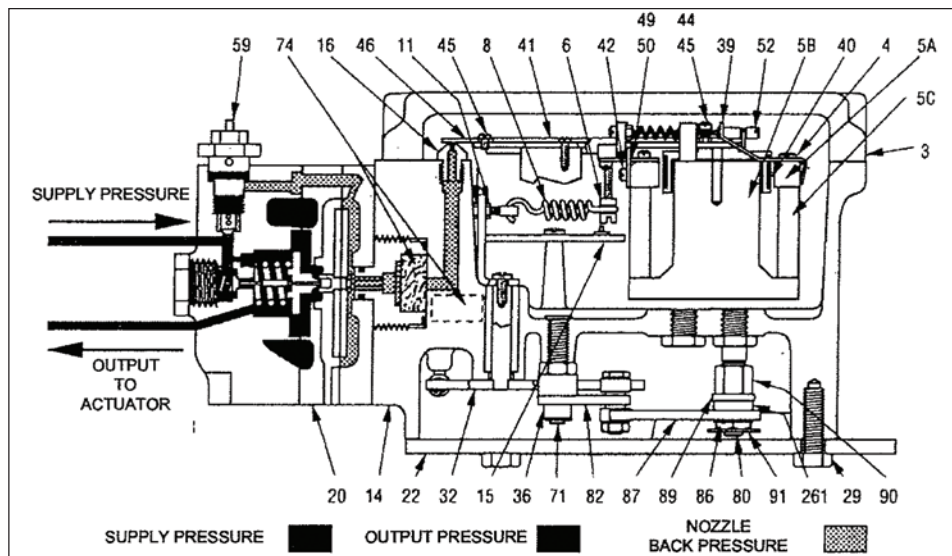


Figure A4 - Positioner with cam

# Calibration of the positioner with cam

1. Connect the electrical signal leads and proper supply pressure tubing to the positioner (see table of correspondence between pressure and nozzle size).
2. Set the input signal at the proper value corresponding to the valve closing.
3. Turn screw (6) of the force-balance spring so this one is approximately parallel to the join of case.
4. Act alternatively on biasing spring adjusting screw (52) and on turnbuckle (263) in order to obtain both valve closing and a space about 2.5 mm between the rear lever edge (261) and the edge of the slot in the positioner case (see figure A6).
5. Set the signal at the proper value corresponding to the valve opening, then verify the actuator stem travel. If it does not correspond to the rated stroke of the valve, proceed as follows:

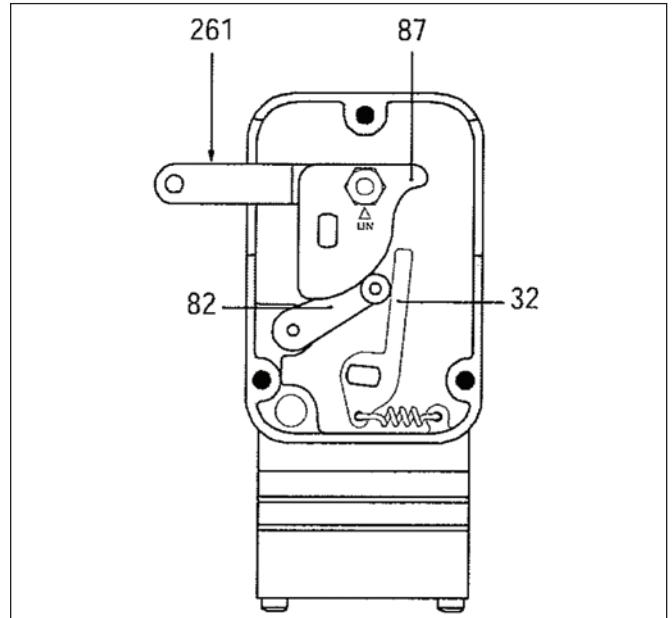


Figure A5 - Linear cam

Case of positioner mounted with the equal percentage cam lobe active

- Rotate the turnbuckle (263) in order to modify the force-balance spring (8) reaction until the actuator stem will be in proper position.
- If the positioner rear lever (261) hits against the case (figure A6), adjust its position by rotating the screw (6) of the force-balance spring (8).
- Repeat successively the steps 2 to 5 until the beginning and the end of valve stroke will correspond exactly to the input signal.

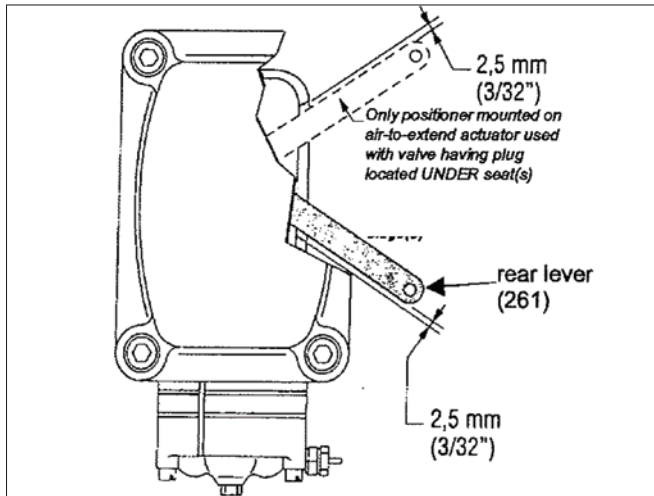


Figure A6 - Position of the rear lever for calibration

Case of positioner mounted with the linear cam lobe active

- Loosen the locknut (7) and turn adjusting screw (6) in one way or another according to the correction to be made (see table below).
- Repeat successively the steps 2 to 5 until the beginning and the end of the valve stroke will exactly correspond to the signal.

Actuator action	Correction to be made on stroke	Rotation direction of adjusting screw (6)
Air-to-close	Increase	On the right
	Decrease	On the left
Air-to-open	Increase	On the right
	Decrease	On the left

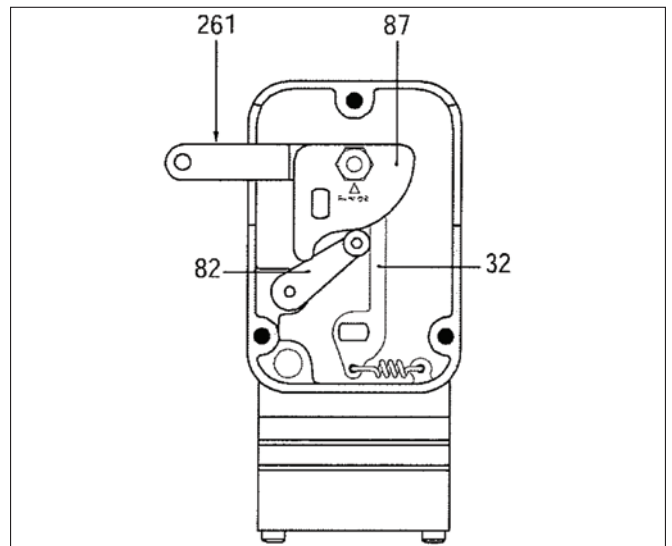


Figure A7 - Equal percentage cam

# Appendix B

## 8013 series positioner without cam mounted on linear valves equipped with 37/38 or 87/88 type actuator

### Description

This positioner operates in the same way as described in the general sections. It is mounted on linear valves equipped with 37/38 or 87/88 type actuator.

### Positioner Mounting and Calibration

#### Mounting of the positioner without cam

8013 series positioner is equipped with bracket which permits to fasten it to an actuator yoke.

**In the case of 37 type direct-action actuator:** the positioner is fastened to the left from the actuator axis, the rear lever being oriented to the right.

**In the case of 38 type reverse-action actuator:** the positioner is fastened to the right from the actuator axis, the rear lever being oriented to the left.

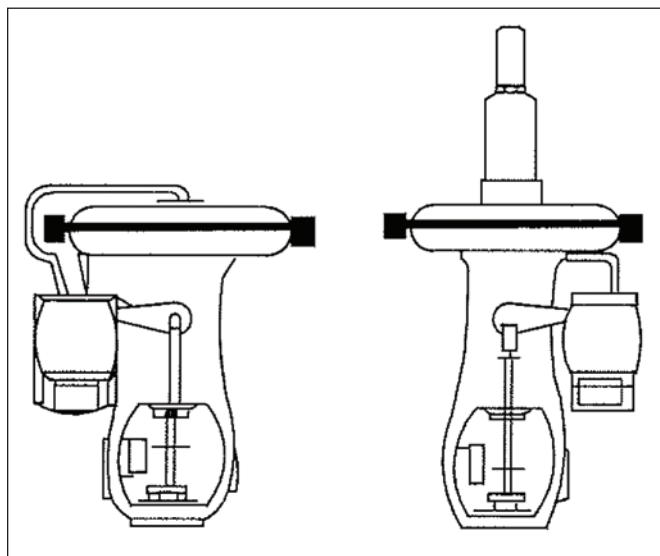


Figure B1 - Mounting of the positioner without cam

When the positioner has been mounted on the actuator yoke, attach and tighten take-off clamps and transmission rod on the actuator stem. The turnbuckle and turnbuckle screw provide an adjustable link between transmission rod and clevis pivoted on the positioner rear lever.

The lower end of the turnbuckle hex has been machined round to identify the right hand thread.

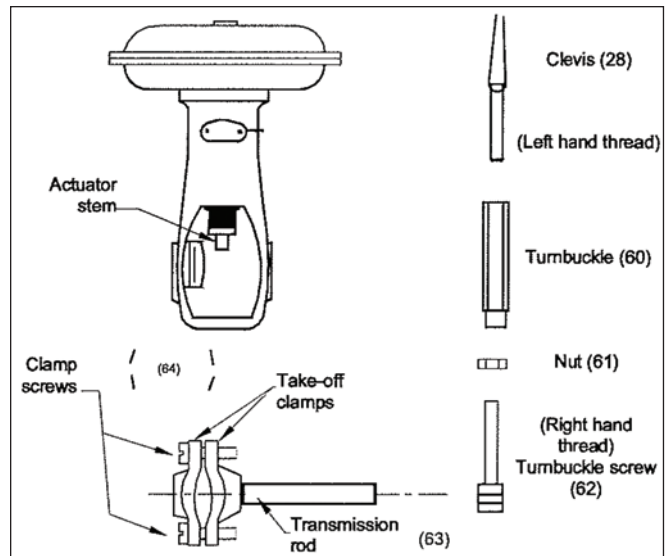


Figure B2 - Linkage accessories

#### Calibration of the positioner without cam (figure B3)

Masoneilan 8013 series positioners when furnished being factory mounted on valve are calibrated for the valve and positioner actions required. In the case a positioner is supplied for field mounting, or if reversal of the positioner action in the field is required, or some electrical components has been replaced, the following steps should be performed to calibrate it:

For these operations, use a current generator with 4 to 20 mA output.

1. Connect input signal leads and air tubing with proper supply pressure, i.e. 20 or 35 psi (1400 or 2450 mbar).
2. Remove the cover (24) located at the back of positioner. Loosen clamp screw (31 G) and rotate the pinion (31 D) until the index is opposite to the marking on the stroke scale corresponding to the stroke required. Tighten the screw (31 G).
3. Set controller for midrange of positioner input signal.
4. Adjust biasing spring (52) tension so that the inside edge of the stroke lever (32) will be parallel to the slot in the stroke adjustment lever (31 A).
5. Rotate the turnbuckle (60) until the valve stem is at its mid-stroke and set parallelism of levers (32 and 31A) by means of biasing spring adjusting screw.
6. Tighten the turnbuckle nut (61) when three following conditions are met:
  - mid-point of input signal
  - mid-stroke position of valve stem
  - levers are parallel

7. Successively change the controller setting for minimum and maximum of the input signal. Note each time the position of the valve stem stroke indicator. If the difference noted between two positions is more than a rated stroke value, loosen the locknut of the screw (6) and rotate this screw clockwise until the full stroke will be obtained.  
If the difference is less than the stroke, rotate the screw counterclockwise. Tighten the locknut.
8. Set controller again for midrange of positioner input signal and recheck parallelism of levers (32 and 31A). Ensure that the valve stem is in midpoint of its stroke. If one of these conditions is not met, repeat steps 4 to 8.

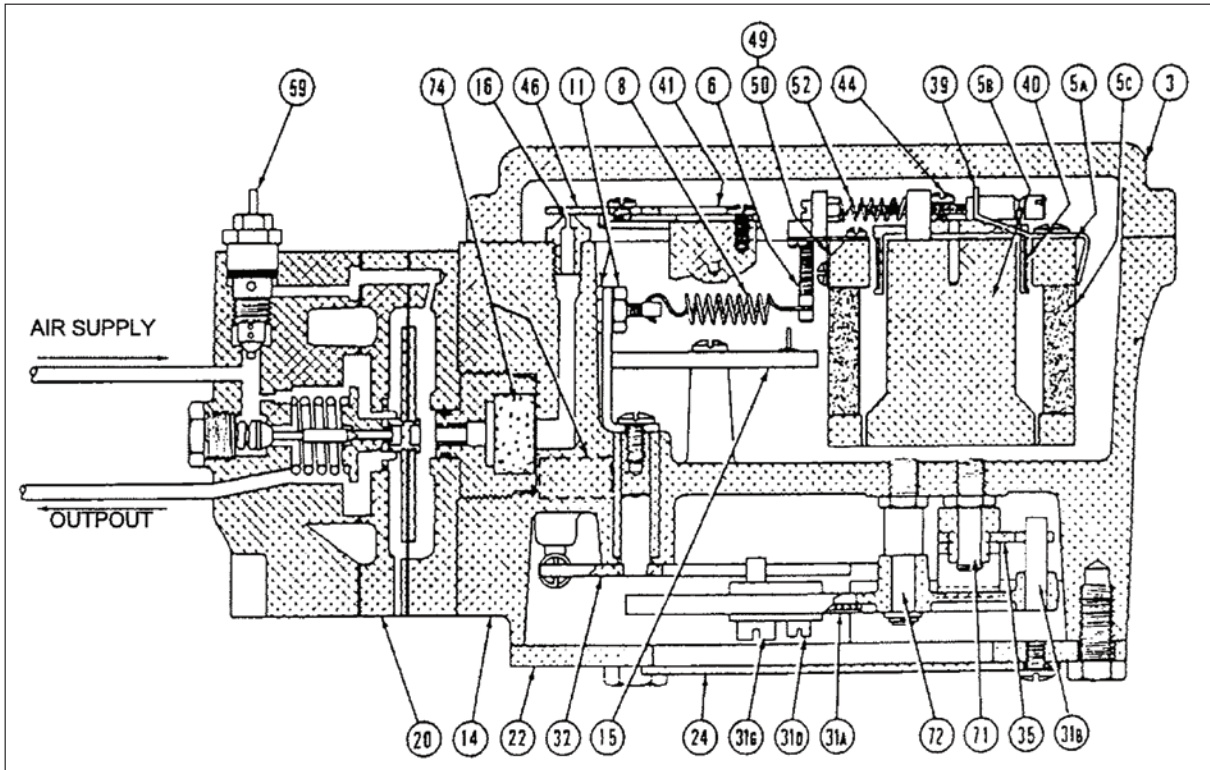


Figure B3 - Positioner without cam

## Nozzle

The table shows different sizes of nozzle. The number of the nozzle is stamped on its body (the nozzle kit is provided with the positioner).

Actuator		Nozzle No.	
Type	No.	Supply Pressure ≤ 30 PSI	Supply Pressure > 30 PSI
37/38	9	11	11
	11	11	11
	13	12	11
	15	13	12
	18	13	12
	24	13	12
87/88	3	11	11
	6	11	11
	10	12	11
	16	13	12
	23	13	12



# Appendix C

## 8013 series positioner mounted on 28000 Series linear VariPak valves

### Description

This positioner operates in the same way as described in general sections. It is mounted on **VariPak™** valves.

The feedback device of this positioner is fitted with a single cam permitting VariPak valve to present linear or equal percentage characteristic.

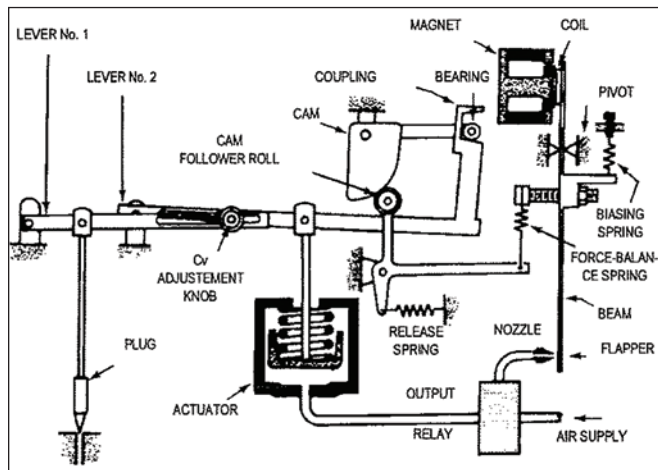


Figure C1 - Operation diagram

### Position of the cam (262), rear lever (257) and bearing (258) 5/A (figures C2, C3, and C7)

The configuration of these three parts assembled depends on the valve action (air-to-close or air-to-open). Figures C2 and C3 show for each case the positions of these elements.

The mark on the cam (“LIN” for linear and “PERC” for equal percentage flow characteristic) must be read on the visible side of the cam when it is mounted and must indicate the cam rotation axis.

In order to change configuration, proceed as follows:

- Using a 6 mm fork wrench loosen the bearing shaft (258) and pull it out.
- Remove three pan head screws (256) and support plate (254) (figure C7).
- Remove retaining ring (91) and pull out the cam/rear lever S/A from the bearing post (80). Remove the cam from the rear lever by loosening nut (90) using a 13 mm fork wrench.

*Note: Apply a little quantity of grease on the bearing post (80).*

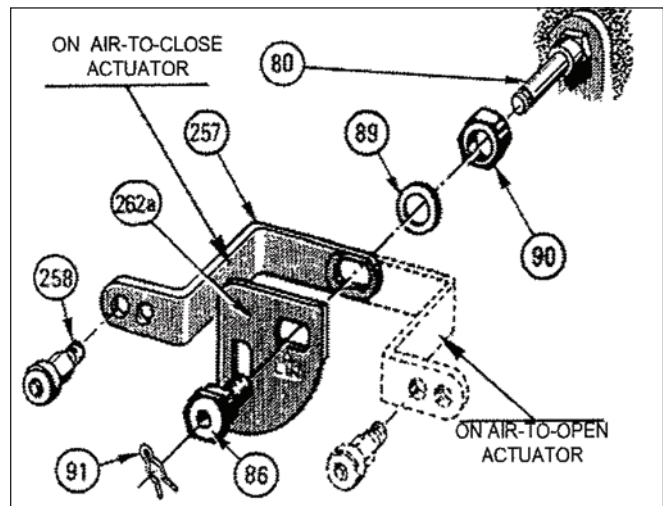


Figure C2 - Cam, rear lever and bearing S/A

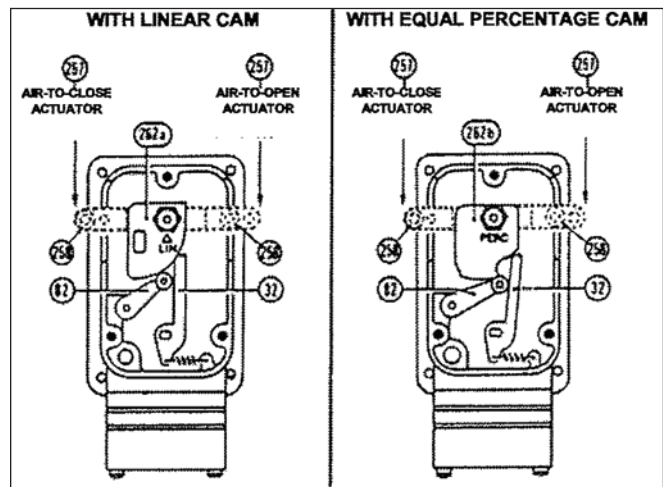


Figure C3 - Position of the came, rear lever and bearing S/A

- Reassemble the cam/lever S/A in the operating position and securely tighten nut (90). Replace the subassembly on post (80). Be careful to correctly place the bearing lever (82) in regard to the cam and the lever (32) of spring (figure C3). Replace retaining ring (91).

## Positioner Mounting and Calibration

### Positioner mounting

Masoneilan 8013 Series positioner with cam is fastened on the actuator bracket of the VariPak valve by means of a support plate (254), three pan head screws (256) and two cap screws (255).

The positioner is always mounted in such a way that the relay is facing downwards and its air connections are directed towards the positioner front.

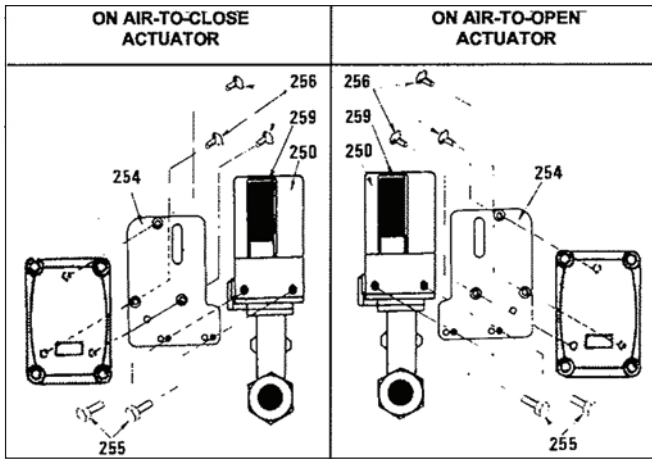


Figure C4 - Position of the support plate

## Fastening (see Figure C5)

- Unscrew four mounting screws of the relay and remove it from case. Remove the cover of the valve (250).
- Position the support plate (254) as required in front of the positioner back.
- Introduce the rear lever (257) (without bearing) into the support plate slot.
- Fasten the plate to the positioner with three pan head screws (256).
- Replace the bearing (258) on the rear lever using a 6 mm fork wrench (see figures C2 and C3 in order to choose the proper introduction hole for the valve action required).
- Fasten the case/support plate S/A to the valve with two cap screws (255) (see figure C4 in order to choose the proper introduction holes).

**Note:** When installing, ensure that the bearing (258) is correctly positioned in the coupling (251) mounted on the end of the VariPak valve lever No. 2 (see figure C5).

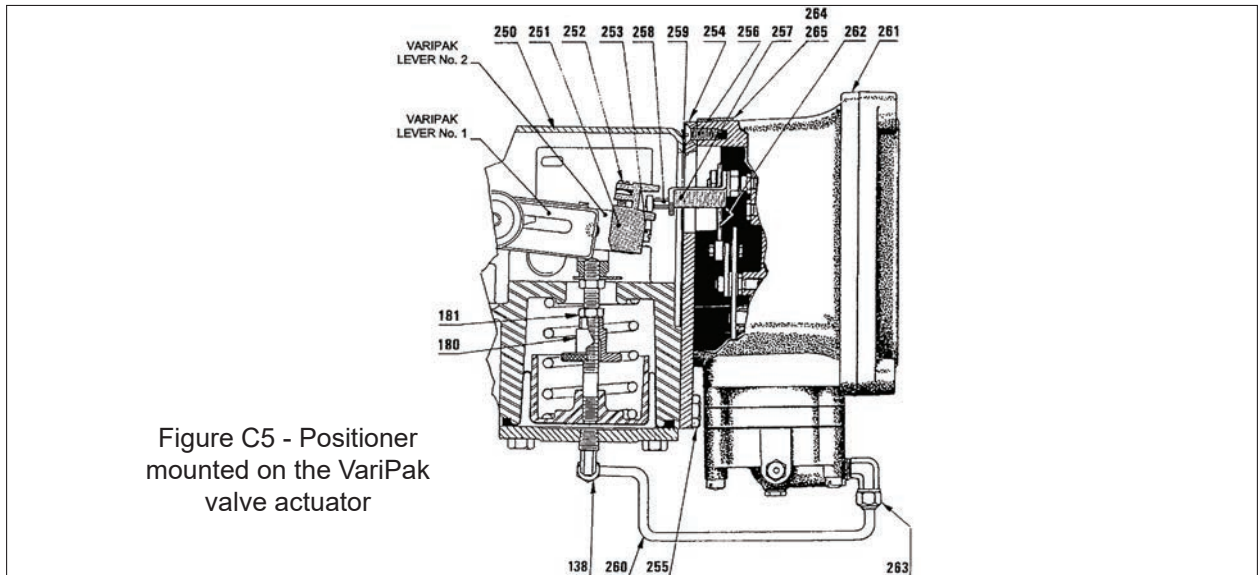


Figure C5 - Positioner mounted on the VariPak valve actuator

- Fasten the relay to the positioner with four screws. Ensure that its connections are oriented to the face.

## Calibration

Masoneilan 8013 Series positioners when furnished being factory mounted on valve are calibrated for the valve and positioner actions required. In the case a positioner is supplied for field mounting, or if reversal of the positioner action in the field is required, or some electrical components has been replaced, the following steps should be performed to calibrate it.

For these operations use a current generator with 4 to 20 mA output.

**Note:** Before calibrating 8013 Series positioner, ensure that the stop limit of the actuator has been adjusted; this will prevent any possible damage to the essential parts of the valve.

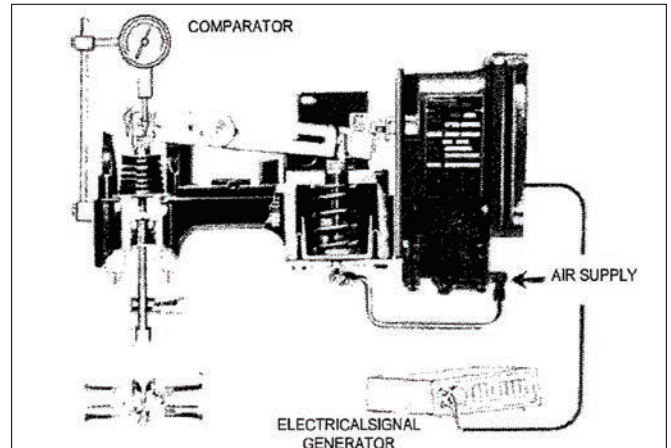


Figure C6 - Calibration arrangement

- The specific stroke of the plug stem should be measured by means of a comparator whose sensor is to be applied to the end of the valve plug stem or at the bottom of the clevis slot.

Calibrate as follows:

### General steps of calibration

- Remove the cover of the VariPak valve.
- Remove the cover of the positioner. Adjust the valve at the maximum  $C_V$  (See Instruction Ref. 30857, paragraph 2.2.3 “ $C_V$  adjustment for each plug and seat ring combination”).
- Connect input signal leads according to the polarities stamped on the terminal board. Connect the air supply line to the positioner and apply a pressure required.
- Check if the position of the force-balanced spring (8) corresponds to the valve action. Turn adjusting screw (6) in order to bring the spring (8) approximately in the parallel position with the joint plane of the case and cover (see figure C7).
- Set comparator to zero:
  - Air-to-open valve: Without air on actuator, the valve is closed. Set comparator to zero.
  - Air-to-close valve: Apply to actuator a pressure approximately equal to the supply pressure by covering the nozzle with the flapper. In order to do it, apply a signal greater than the maximum value and/or turn the screw of the biasing spring (52). Set comparator to zero.

2. Loosen screw (253) using a special 4 mm Allen wrench (length of a small leg: 10 mm) and turn coupling adjusting screw (252) so that the coupling (251) is adjusted in its lowest position on air-to-open valve or in its highest position on air-to-close valve (see figure C5).
3. Turn biasing spring adjusting screw (52) until the rear lever is in horizontal position. This reference position can be considered as reached when the distance between the top of the rear lever (257) and the upper edge of the support plate (254) measured with a rule is equal to 27 mm (see figure C8).

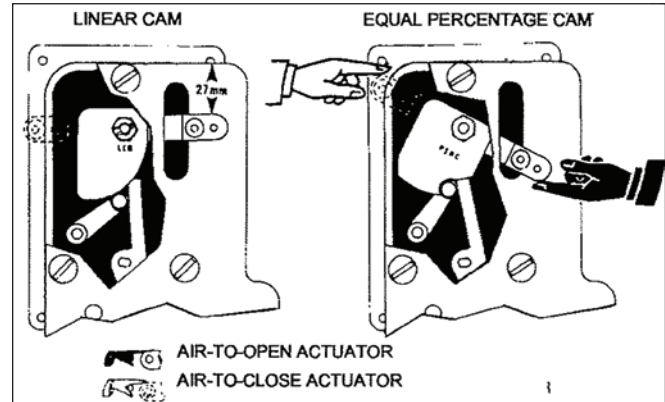


Figure C8 - Reference position of the cam/back lever S/A

### Case of positioner equipped with a linear cam

After the above-mentioned five steps have been performed, proceed to the positioner calibrating as follows:

1. Adjust the signal to its midrange value (for example, 12mA for a signal 4 to 20 mA).

4. Turn coupling adjustment screw (252) until the comparator pointer indicates the mid-stroke position of the plug stem. Tighten set screw (253) (see figure C5).
5. Adjust the signal to the value required to obtain the valve closing.

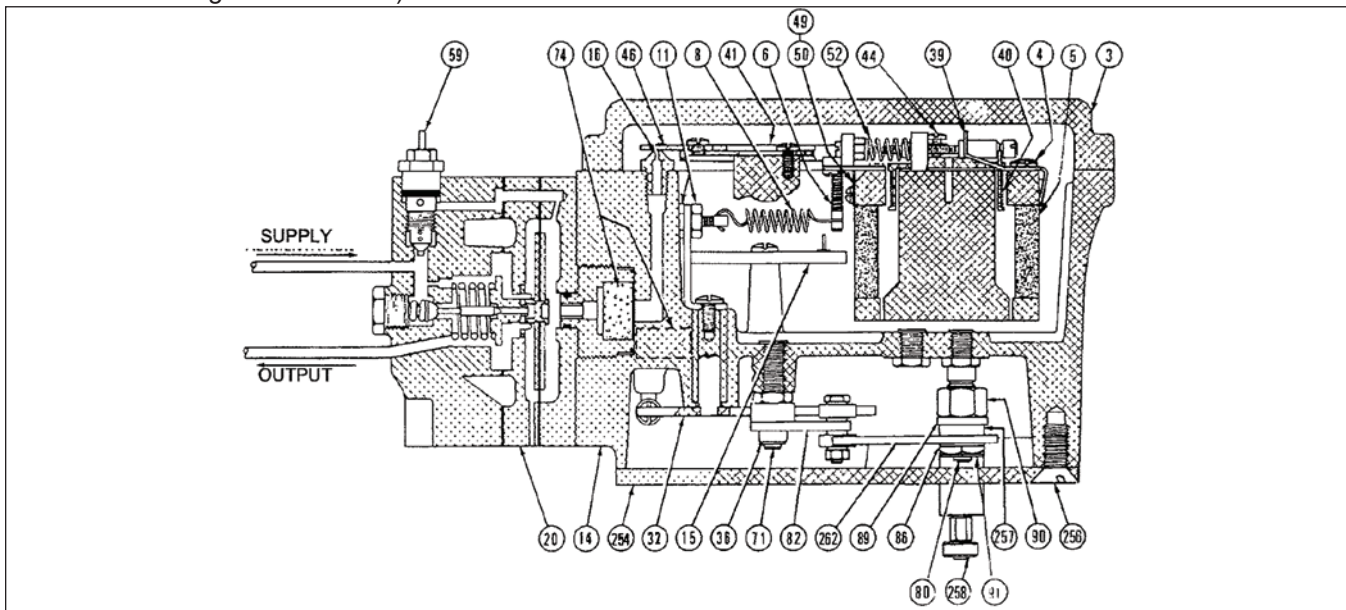


Figure C7 - Sectional view of the positioner



6. Turn biasing spring adjusting screw (52) in the direction that can cause the valve closing (the comparator pointer tends to turn counterclockwise).
7. If the pointer does not move or reaches its stop (the plug touches the seat), rotate the screw (52) in the opposite direction until the comparator pointer begins just to turn clockwise (the plug takes off from the seat).
8. On air-to-close valve, it may be necessary to readjust the comparator zero setting in this last position of the pointer.
9. Adjust the signal to its midrange value and check the plug travel by reading the comparator indications. If this travel is not equal to the rated mid-stroke value (1.25 mm), loosen the locknut (7) and rotate the screw (6) in one direction or another, depending on correction to be made and actuator action (see figure C9).
10. Readjust the signal to the value corresponding to the valve closing and check if the comparator zero is still obtained. If not, repeat the steps 5 to 10.
11. Adjust the signal to the value corresponding to the valve opening and ensure with comparator that the stem travel is equal to the rated stroke (2.5 mm). If not, repeat the steps 1 to 11.
12. Remove the comparator. Replace the positioner and valve covers. Put the valve into operation.

Actuator Action	Stroke Adjustment	Direction of Adjusting Screw Rotation
Air-to-Open	Decrease	To the Right
	Increase	To the Left
Air-to-Close	Decrease	To the Left
	Increase	To the Right

Figure C9 - Adjustment of the force-balance spring (8)

## Case of positioner with equal percentage cam

After five general calibration steps have been performed, proceed as follows:

1. Adjust the signal to the value corresponding to the valve closing. If the actuator stem, on the air-to-open valve, is in intermediate position, then turn biasing spring screw (52) so there is no air under the stem.
2. Loosen screw (253) using a special 4 mm Allen wrench (length of a small leg: 10 mm) and turn coupling adjusting screw (252) so that the bearing (258) of the rear lever (257) is lightly loaded by operating face of the coupling (approximately one

screw turn after the bearing-to-coupling contact) (see figure C10).

3. Press by finger the rear lever (257) so that the roll of the lever (82) is just settled in the concave part of cam profile. This reference position is correct only if you feel a tough point at the beginning of the rear lever movement (see figure C8).
4. Maintaining the rear lever in this position, turn biasing spring adjusting screw (52) till the moment when the plug takes off from its seat. The precise point of the plug opening will be indicated by the comparator pointer.
5. Go on with maintaining the rear lever in its reference position (step 7) and turn the coupling adjusting screw (252) so that the operating face of the coupling (251) has just come into contact with the bearing (258). Tighten the screw (253) (see figure C10).
6. Adjust the signal to the value corresponding to the valve opening and check the plug stem travel using a comparator. If this travel is not equal to the rated stroke (2.5 mm), loosen the locknut (7) and turn the screw (6) in one direction or another depending on a correction to be made and the actuator action (251) (see figure C9). Tighten the nut (7).
7. Readjust the signal to the value corresponding to the valve closing and check if comparator is still set to zero. If not, repeat the steps 4, 6, and 7.
8. Remove the comparator. Replace the positioner and valve covers. Put the valve into operation

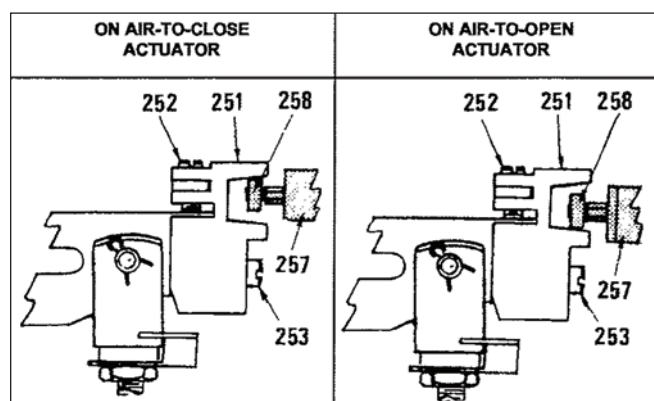


Figure C10 - Operating face of the coupling (251)

# Appendix D

## 8013 Series positioner mounted on 35002 Series Camflex and 30000 Series Varimax control valves

### Description

This positioner operates in the same way as described in the general sections. It is mounted on control valves.

The feedback device of the positioner is fitted with a single cam with several lobes permitting the valve to present one of the following characteristics: linear, split-ranging linear, equal percentage. The cam is directly mounted on the end of the valve shaft on **Camflex™ II control valve** or on the pivot of the actuator case on **Varimax™ control valve**; thus avoiding the drawbacks.

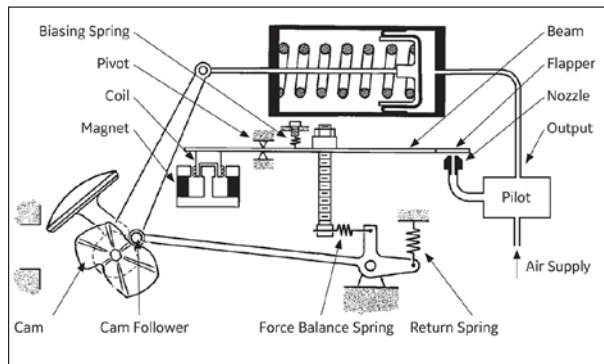


Figure D1 - Functional Diagram

## Positioner Mounting, Cam Orientation and Calibration


### Positioner mounting

**Note:** If the cam (155) has been mounted on the valve shaft, remove it before installing the positioner.

With two cap screws (152) and a countersunk screw, assemble the mounting plate (171) on the molded bracket of the positioner and on the positioner. (The molded bracket is already fastened to the positioner with two fillister head screws). Then secure this assembly on the valve yoke with two countersunk screws (172). The orientation of the positioner on the valve is function of the actuator action. It is indicated in figure D2.

### Cam mounting and orientation

- Select the proper cam lobe for the flow control characteristic required for the valve (see figure D4).
- Place the cam (155) on the bushing (159) so that the identification number of the lobe required is facing away when the cam bushing is assembled (see figure D5).
- Place the spring washer (156) on the cam screw (160).

 **CAUTION**

**If the cam bushing hex protrudes through the hole in the front side of the cam, it means that the cam is mounted on the **WRONG** end of the cam bushing.**

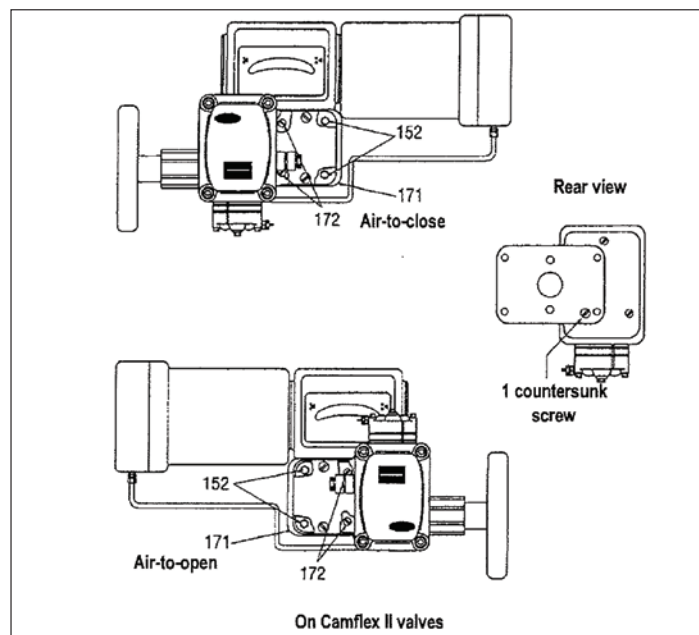


Figure D2 - Mounting position of 8013 Series positioner with cam

- Place cam with cam bushing on the cam screw (160) (with cam against the outside diameter of the spring washer).
- Place lock washer (158) on the screw end and mount on the Camflex II valve shaft or on the Varimax valve pivot. Turn the cam in order to line up the origin mark of the active lobe with the center of the bearing as indicated in figure D5.

## CAUTION

**Lift cam follower bearing so as to allow the active lobe origin mark to align with the follower bearing. Tighten cap screw (160).**

## Calibration

### General

- 8013 Series positioner when furnished being factory mounted on valve are calibrated for the valve and positioner actions required. If, for any reason, the adjustment of the cam and its bushing (159) was disturbed (par example, in order to modify the positioner action, to change an active lobe of cam, to install in the field or for maintenance purposes, etc.), it is necessary to recalibrate the positioner performing

all steps which correspond to the positioner and actuator actions.

- Connect air lines to the positioner and actuator. Connect input signal leads respecting polarities stamped on the terminal board.
- Ensure that the force-balance spring position corresponds to the direction of the positioner action.
- Turn the force-balance adjusting screw (6) on the beam (41) so that the spring should be approximately parallel to the joint plane of the case.

### On air-to-open valve

After the general steps have been performed, proceed as follows:

- Shut-off supply pressure. The valve should be closed.
- Proceed with calibration as it is described in the paragraph "On air-to-close or on air-to-open valve".

### On air-to-close valve

After the general steps have been performed, proceed as follows:

- Adjust supply pressure to proper value required.
- Using a 10 mm flat wrench unscrew about one turn the metering tube assembly (59) so that the valve is closed.

### On air-to-close or on air-to-open valve

After the calibrating steps have been performed for the valve concerned, proceed as follows:

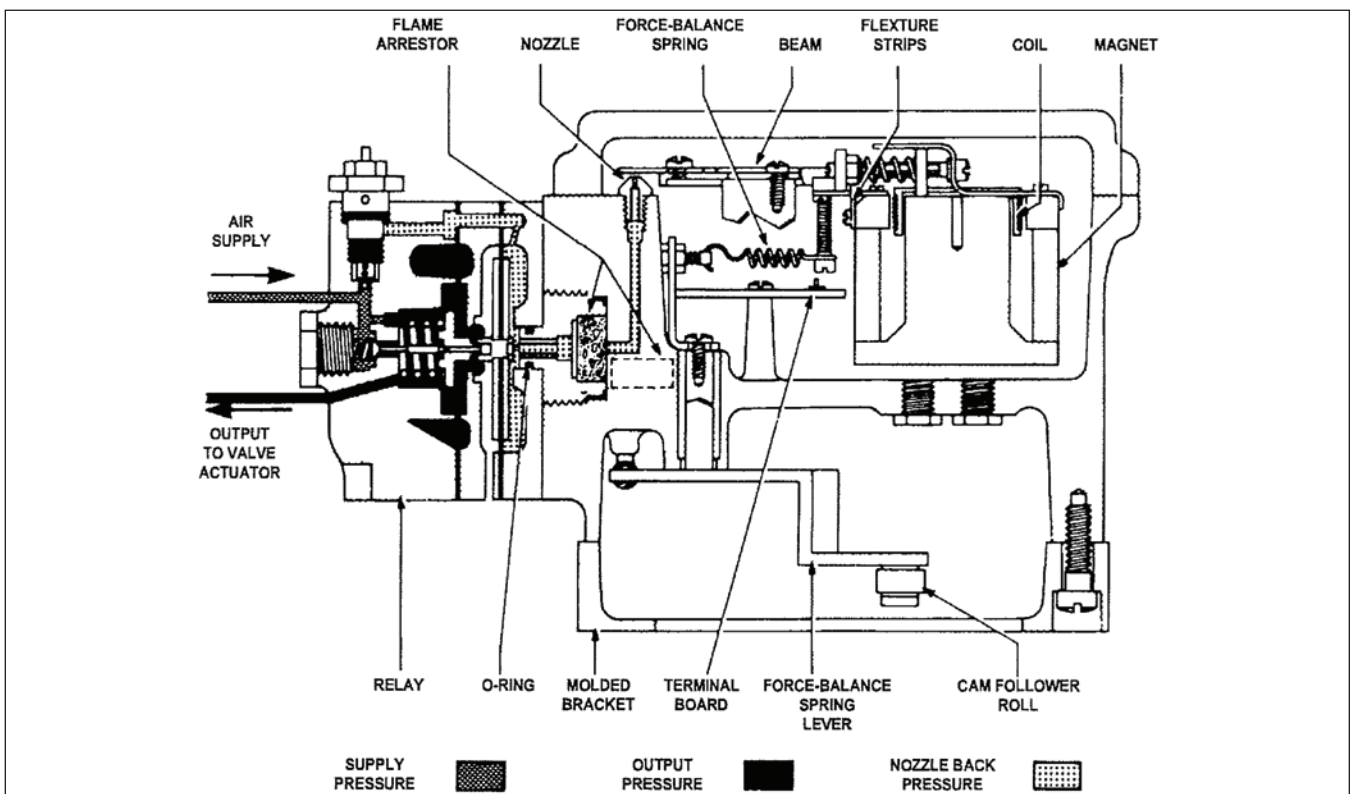


Figure D3 - Diagram of positioner pneumatic circuit

- When the valve plug is in contact with its seat, loosen the screw (160) so that the cam can rotate.
- Select proper cam lobe and origin mark of this lobe referring to figure D4.
- Rotate the cam in order to align the origin mark of the proper lobe with the center of cam follower bearing as indicated in figure D5. Tighten screw (160) in order to maintain the cam position towards the cam follower.

**If air supply is shut-off (air-to-open valve),** adjust supply pressure to proper value, see valve catalogue or serial plate.

**On air-to-close valve** tighten metering tube assembly (59). Tighten firmly but do not over-tighten.

- Adjust the signal to proper value corresponding to valve closing.
- Adjust the biasing spring (52) so that the valve plug will just take off from the seat at the proper signal for valve closing.
- Ensure that the valve stem performs its full stroke for full signal span. If stroke is too short for full signal span or if the stem performs full stroke before the signal

reaches its full span (stroke is too long), adjust force-balance spring screw (6) as indicated in the following table (figure D4).

After adjusting force-balance spring, repeat two preceding steps until proper valve stroke is obtained for full signal span.

- Replace the cover (3) and the cam cover (151).

Force-balance Spring Screw Adjustments		
If stroke is:	And positioner action is:	Turn force-balance spring adjusting screw (6):
Too short	Direct	Counterclockwise
	Reverse	Clockwise
Too long	Direct	Clockwise
	Reverse	Counterclockwise

Figure D4 - Force-balance spring screw adjustment table

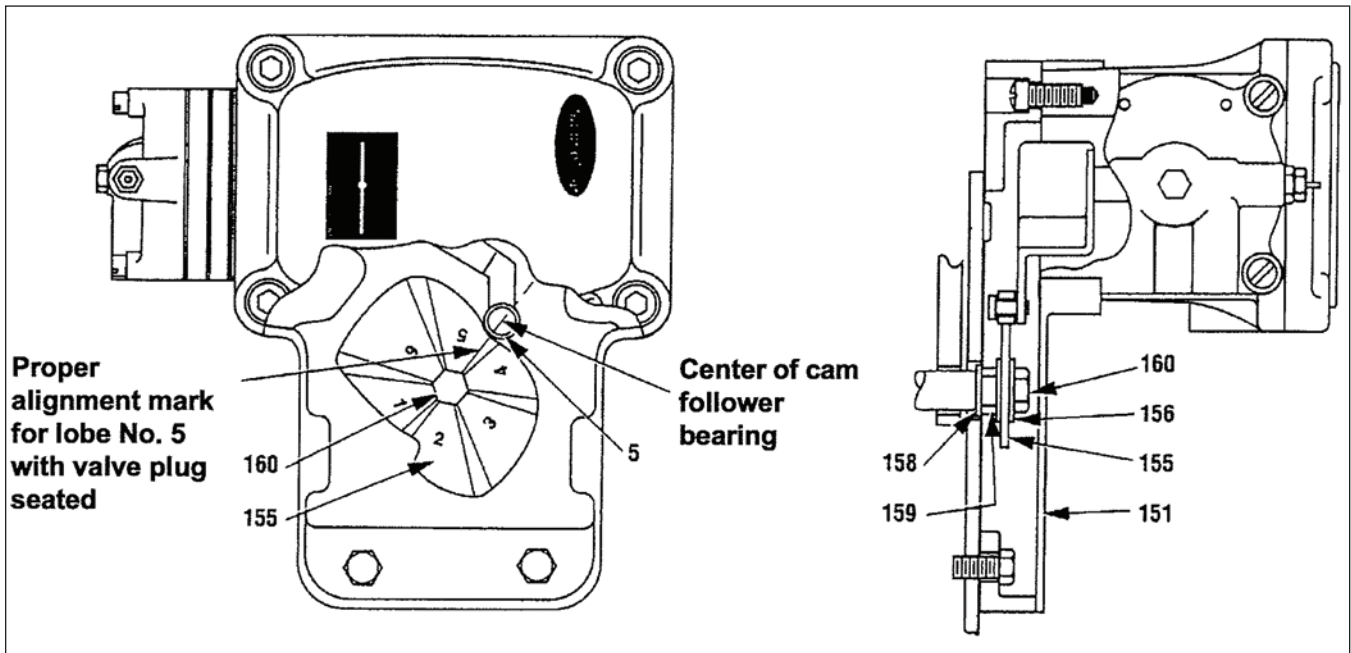


Figure D5 - Cam follower bearing

Selection of the proper origin mark on cam lobe for alignment with cam follower bearing.

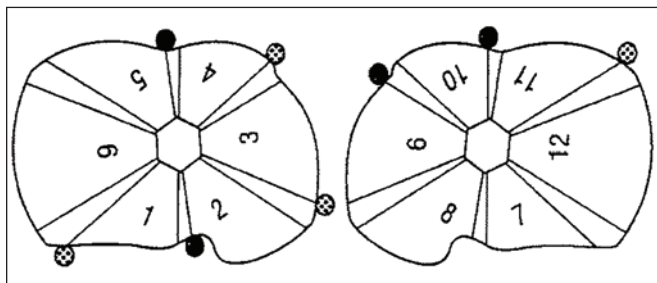


Figure D6 - Origin marks on cam lobe

Position of cam follower bearing shown in respect to lobe origin mark.

**Camflex II cam part number: 041126-181**

**Varimax cam part number: 400110353**

8013 Series Position of Cam Follower Bearing			
Valve Action	Positioner Action	Range & Characteristics	Cam Lobe
Air to Open	Direct	0-100% Lin.	5
		0-100% Perc.	2
		0-50% Lin.	10
		50-100% Lin.	9
	Reverse	0-100% Lin.	11
		0-100% Perc.	1
		0-50% Lin.	4
		50-100% Lin.	3
Air to Close	Direct	0-100% Lin.	11
		0-100% Perc.	1
		0-50% Lin.	4
		50-100% Lin.	3
	Reverse	0-100% Lin.	5
		0-100% Perc.	2
		0-50% Lin.	10
		50-100% Lin.	9

Figure D7 - Position of the cam follower bearing

1. Select required cam lobe number according to the valve action, positioner action, range and characteristic. Observe shading code.
2. Rotate the cam in order to align proper lobe origin mark (see code) with center of the cam follower bearing (see figure D5).

## Nozzle

The table below shows different sizes of nozzle. The number of the nozzle is stamped on its body (the nozzle kit is provided with the positioner).

### On Camflex Valves

Supply Pressure		Nozzle Number Nominal size of the valve		
psi	m bar	25 to 50 mm (1 to 2 in.)	80 and 100 mm (3 and 4 in.)	150 to 300 mm (6 to 12 in.)
20	1379	15	12	
25	1724	15	12	
30	2068	15	11	13
35	2413		11	13
40	2758		11 <sup>(1)</sup>	12
45	3103		11 <sup>(1)</sup>	12
50	3447			12
55	3792			12
60	4137			12
65	4482			11
70	4826			11
75	5171			11

(1) Only on DN 100 mm (4 in.) valves.



# Appendix E

## 8013 Series positioner mounted on 37002 Series MiniTork II valves

### Description

This positioner operates in the same way as described in the general sections. It is mounted on control valves.

The feedback device of the positioner is fitted with a single cam with several lobes permitting the **MiniTork™ valve** to present one of the following characteristics: equal percentage, split-ranging equal percentage. The cam is directly mounted on the end of the valve shaft, thus avoiding the drawbacks inherent to the connecting linkage.

### Positioner Mounting, Cam Orientation and Calibration

#### Positioner mounting

*Note: If the cam (155) has been mounted on the valve shaft, remove it before installing the positioner.*

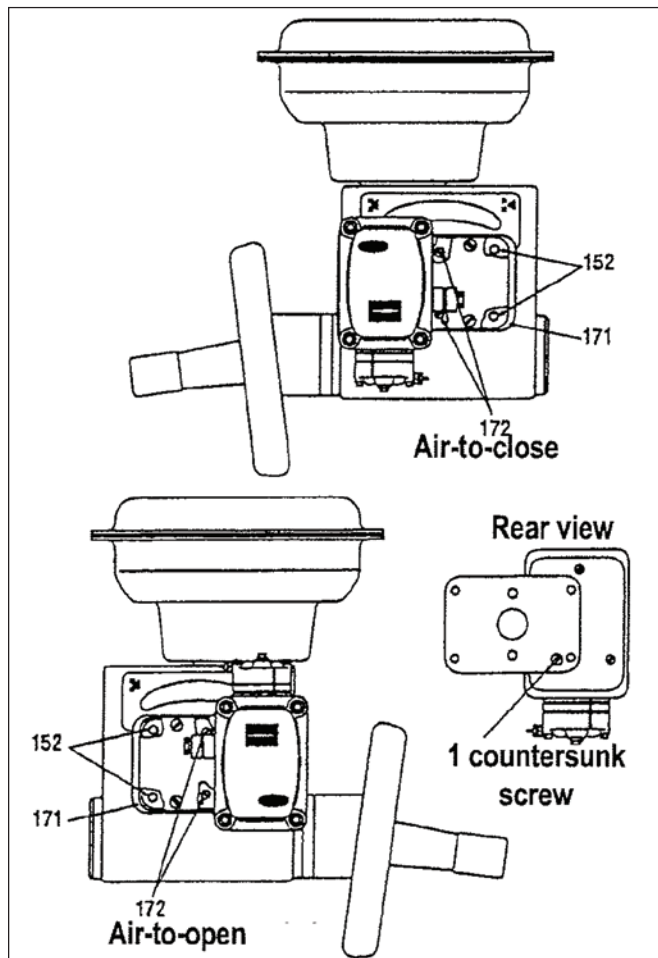


Figure E1 - Mounting position of 8013 Series

With two cap screws (152) and a countersunk screw, assemble the mounting plate (171) on the molded bracket of the positioner and on the positioner (the molded bracket is already fastened to the positioner with two fillister head screws). Then secure this assembly on the valve yoke with two countersunk screws (172). The orientation of the positioner on the valve depends on the actuator action. It is indicated in figure E1.

### Cam mounting and orientation

Select the proper cam lobe for the flow control characteristic required for the valve (see figure E4).

Place the cam (155) on the bushing (159) so that the identification number of the lobe required is facing away when the cam bushing is assembled (see figure E3).

### CAUTION

If the cam bushing hex protrudes through the hole in the front side of the cam, it means that the cam is mounted on the **WRONG** end of the cam bushing.

Place the spring washer (156) on the cam screw (160). Place cam with cam bushing on the cam screw (160) (with cam against the outside diameter of the spring washer).

Place tongued lock washer (158) on the screw end and mount on the MiniTork II valve. Turn the cam in order to line up the origin mark of the active lobe with the center of the bearing as indicated in figure E3.

### CAUTION

Lift cam follower bearing so as to allow the active lobe origin mark to align with the follower bearing. Tighten cap screw (160).

# Calibration

## General

- 8013 Series positioner when furnished being factory mounted on valve are calibrated for the valve and positioner actions required. If, for any reason, the adjustment of the cam and its bushing (159) was disturbed (for example, in order to modify the positioner action, to change an active lobe of cam, to install in the field or for maintenance purposes, etc.), it is necessary to recalibrate the positioner performing all steps which correspond to the positioner and actuator actions.
- Connect air lines to the positioner and actuator. Connect input signal leads respecting polarities stamped on the terminal board.
- Ensure that the force-balance spring position corresponds to the direction of the positioner action.

- Turn the force-balance adjusting screw (6) on the beam (41) so that the spring should be approximately parallel to the joint plane of the case.

## On air-to-open valve

After the general steps have been performed, proceed as follows:

- Shut-off supply pressure. The valve should be closed.
- Proceed with calibration as it is described in the paragraph "On air-to-dose or on air-to-open valve".

## On air-to-close valve

After the general steps have been performed, proceed as follows:

- Adjust supply pressure to proper value required.
- Using a 10 mm flat wrench, unscrew about one turn the metering tube assembly (59) so that the valve is closed.

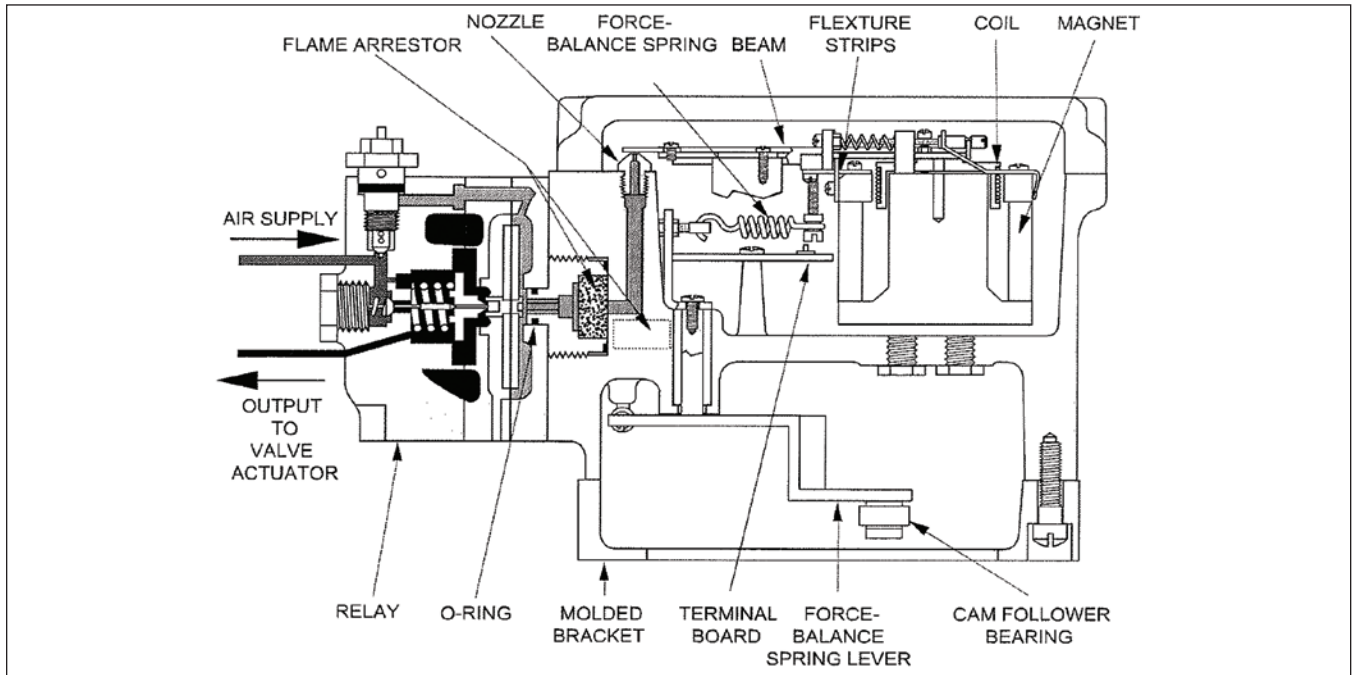


Figure E2 - Diagram of positioner pneumatic circuit

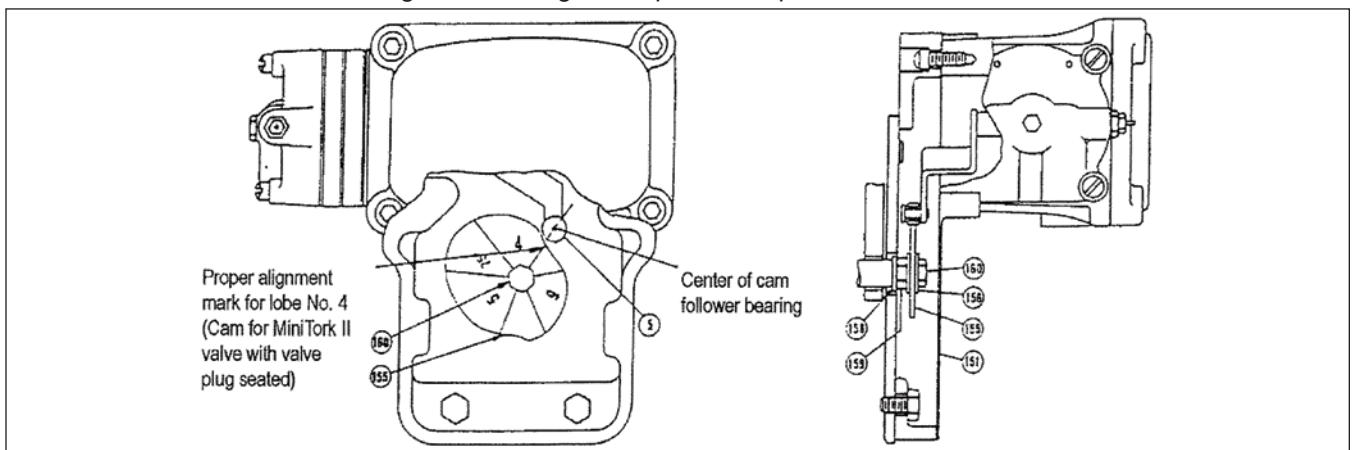


Figure E3- Cam follower bearing



## On air-to-close or on air-to-open valve

After the general calibrating steps have been performed for the valve concerned, proceed as follows:

- When the valve plug is in contact with its seat, loosen the screw (160) so that the cam can rotate.
- Select proper cam lobe and origin mark of this lobe referring to figure E4.
- Rotate the cam in order to align the origin mark of the proper lobe with the center of cam follower bearing as indicated in figure E3. Tighten screw (160) in order to maintain the cam position towards the cam follower.

**If air supply is shut-off (air-to-open valve),** adjust supply pressure to proper value (see valve catalogue or serial plate).

**On air-to-close valve,** tighten metering tube assembly (59). Tighten firmly but do not over-tighten.

- Adjust the signal to proper value corresponding to valve closing.
- Adjust the biasing spring (52) so that the valve plug will just take off from the seat at the proper signal for valve closing.
- Ensure that the valve stem performs its full stroke for full signal span. If stroke is too short for full signal span or if the stem performs full stroke before the signal reaches its full span (stroke is too long), adjust force-balance spring screw (6) as indicated in the table below. After adjusting force-balance spring, repeat two preceding steps until proper valve stroke is obtained for full signal span.
- Replace the cover (3) and the cam cover (151).

Force-balance Spring Screw Adjustments		
If stroke is:	And positioner action is:	Turn force-balance spring adjusting screw (6):
Too short	Direct	Counterclockwise
	Reverse	Clockwise
Too long	Direct	Clockwise
	Reverse	Counterclockwise

## 8013 Series positioner on MiniTork II valve:

Selection of the proper origin mark on cam lobe for alignment with cam follower bearing.

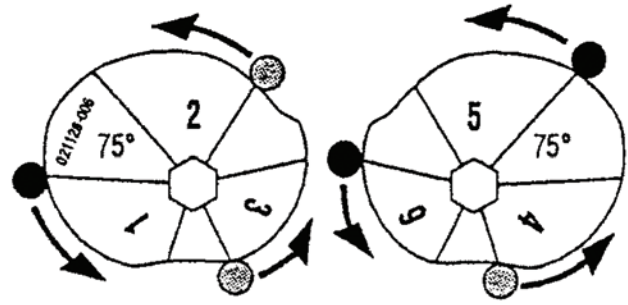


Figure E4 - Position of the cam follower bearing

Position of cam follower bearing shown in respect to lobe origin mark.

8013 Series Position of Cam Follower Bearing			
Valve Action	Positioner Action	Range & Flow Characteristics	Cam Lobe
Air to Open	Direct	0-100% Perc.	4
		0-50% Perc.	3
		50-100% Perc.	2
	Reverse	0-100% Perc.	1
		0-50% Perc.	6
		50-100% Perc.	5
Air to Close	Direct	0-100% Perc.	1
		0-50% Perc.	4
		50-100% Perc.	3
	Reverse	0-100% Perc.	4
		0-50% Perc.	3
		50-100% Perc.	2

1. Select required cam lobe number according to the valve action, positioner action, range and characteristic. Observe shadowed code.
2. Rotate the cam in order to align proper lobe origin mark (see code) with center of the cam follower roll (see figure E3).

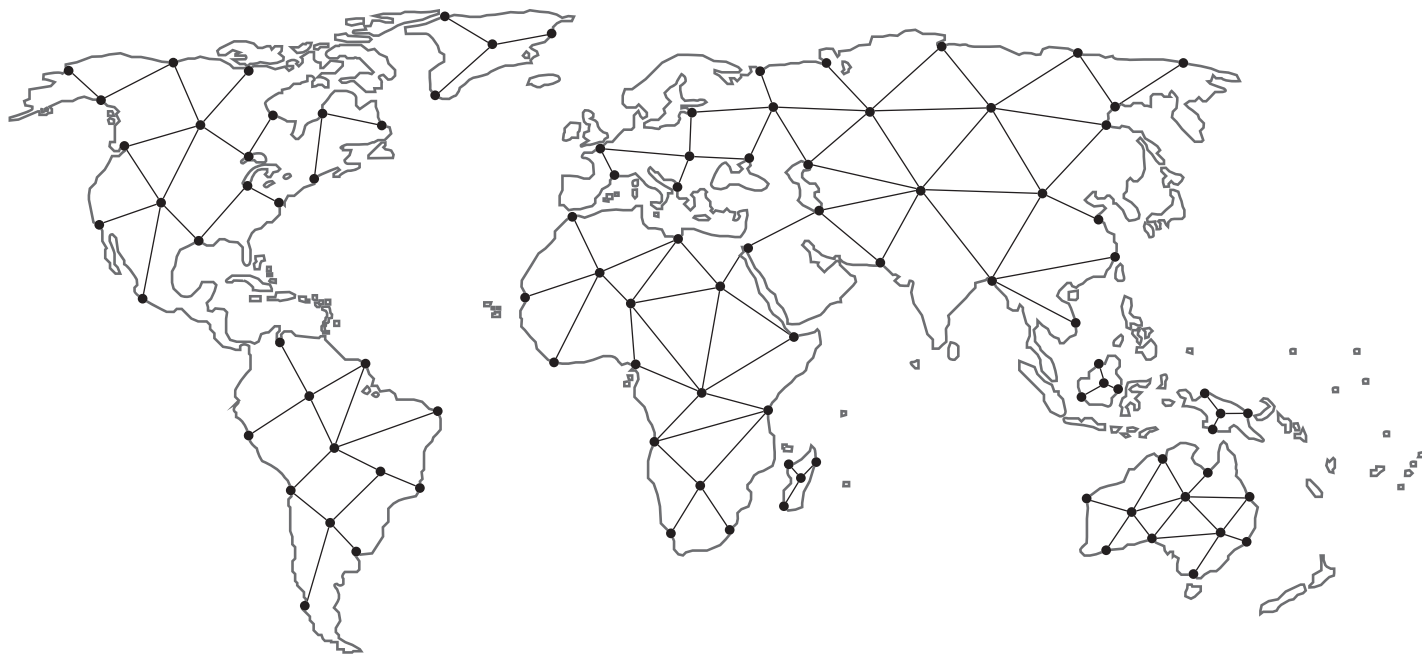
# Nozzle

The table below shows different sizes of nozzle. The number of the nozzle is stamped on its body.

Supply Pressure		Nominal Size of MiniTork II Valve Actuator		
psi	mbar	30	70	140
1.379	20	11	11	13
1.517	22	11	11	13
1.655	24	11	11	13
1.862	27	11	11	12
2.068	30	11	11	12

# Find the nearest local Channel Partner in your area:

[valves.bakerhughes.com/contact-us](https://valves.bakerhughes.com/contact-us)



## Tech Field Support & Warranty:

Phone: +1-866-827-5378

[valvesupport@bakerhughes.com](mailto:valvesupport@bakerhughes.com)

[valves.bakerhughes.com](https://valves.bakerhughes.com)

Copyright 2023 Baker Hughes Company. All rights reserved. Baker Hughes provides this information on an "as is" basis for general information purposes. Baker Hughes does not make any representation as to the accuracy or completeness of the information and makes no warranties of any kind, specific, implied or oral, to the fullest extent permissible by law, including those of merchantability and fitness for a particular purpose or use. Baker Hughes hereby disclaims any and all liability for any direct, indirect, consequential or special damages, claims for lost profits, or third party claims arising from the use of the information, whether a claim is asserted in contract, tort, or otherwise. Baker Hughes reserves the right to make changes in specifications and features shown herein, or discontinue the product described at any time without notice or obligation. Contact your Baker Hughes representative for the most current information. The Baker Hughes logo, Masoneilan, Camflex, MiniTork, Varimax, and VariPak are trademarks of Baker Hughes Company. Other company names and product names used in this document are the registered trademarks or trademarks of their respective owners.

**Baker Hughes** 

[bakerhughes.com](https://bakerhughes.com)