

# Pneumatic Positioners

# MIL 7400

A sensitive stable force balance system for standard or non-standard valves.

## Foreword

MIL 7400 positioner ensures that the position of the valve plug is directly proportional to the controller output pressure, regardless of packing box friction, diaphragm actuator hysteresis or off-balance forces on the valve plug. This also provides the means of changing the effective output pressure range of a controller or changing the valve action.



## Responsive to small pressure changes

When complicated process lags necessitate wide control proportional band, the positioner provides exact means of making the control valve responsive to very small changes in controller output pressure.

## Operates any standard or non-standard valve

The positioner may be supplied to operate any valve, whether with standard or non-standard spring, and for number of signal ranges.

## Bypass facility

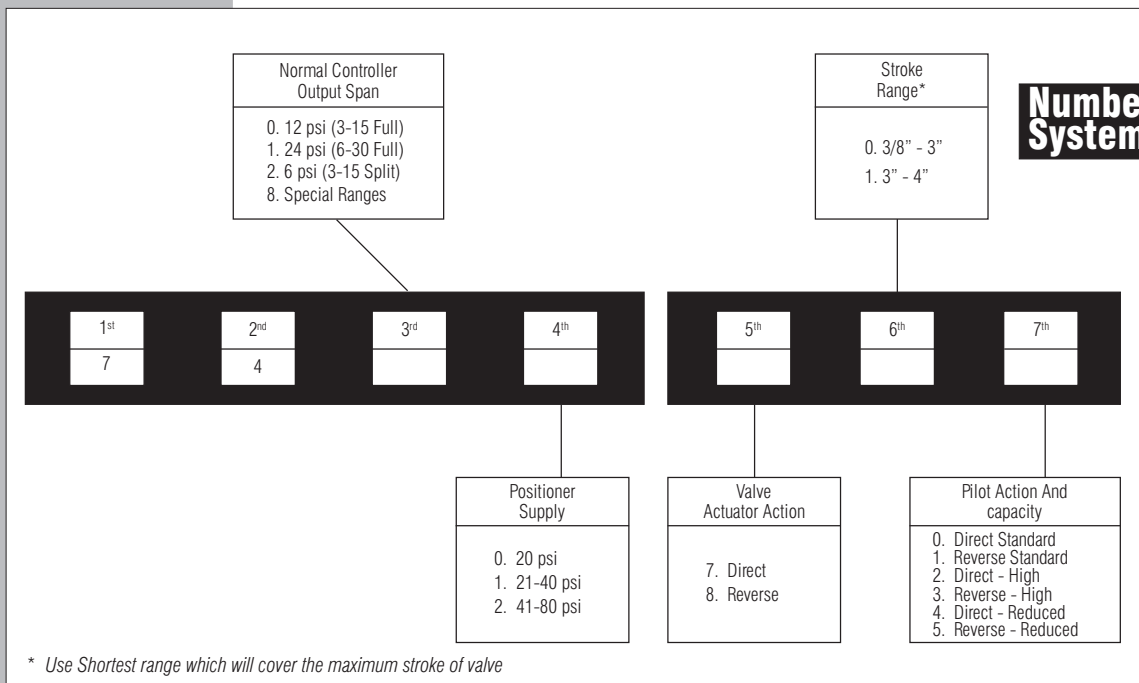
With Bypass set at "Positioner", the signal pressure is directly carried to the bellows & supply is brought to the pilot for normal operation. When set at "Bypass" position, the supply is blocked and signal pressure directly goes to the control valve.

## Standard, Reduced and High Capacity Pilots

The simple, sensitive pilot of 3-way valve type has sufficient capacity to operate the control valve at required speed and uses relatively little air. Pilots are available for standard, reduced and high capacity.

## Split Range

For sequential operation of 2 or 3 valves by single controller with a 3-15 psi output signal range, each positioner equipped valve is operated through its full spring range by a selected portion of the controller output signal range.



**Instrument Signals**

- Standard : 3-15 psi and 6-30 psi
- Split range : 6 psi (3-15 Split)
- Maximum positioner output : 20, 40 and 80 psi
- Stroke ranges : 3/8" - 3" and 3" - 4"

**Action**

- Direct Pilot : Increasing signal increases output pressure
- Reverse Pilot : Increasing signal decreases output pressure
- Accuracy : 0.2% of valve stroke

**Air Consumption (max.)**

- Standard Pilot : (3-15) 0.4 scfm  
(6-30) 0.56 scfm
- High Capacity Pilot : (3-15) 0.6 scfm  
(6-30) 0.84 scfm

In determining compressor capacity double the above consumption figures, to allow for line leakage and condensate blow down

**General Data**

Actuator Size	Valve Stroke (inches)	Stroking time (seconds)	Actuator Size	Valve Stroke (inches)	Stroking time (seconds)
9	1/2	2.5	15	1 1/2	17
	3/4	4.0		2	20
11	3/4	5.5	18	2	30
	1	7.0		2 1/2	34
13	1	11	18L	3 1/2	44
	1 1/2	13		4	48
			24	4	82

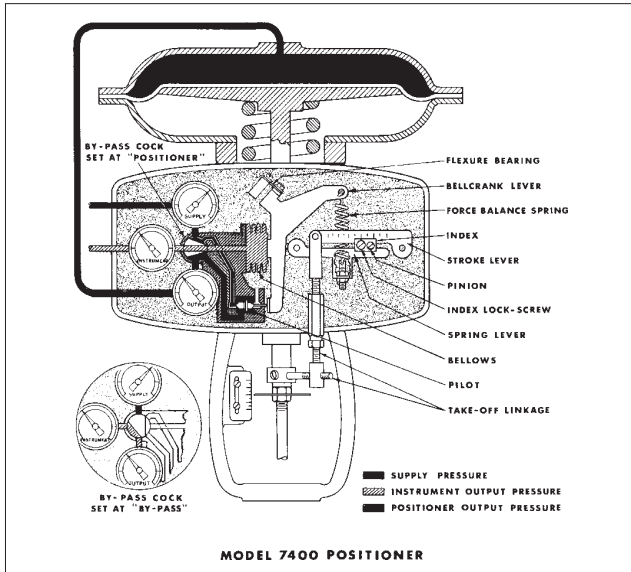
**Valve Stroking time\***

\* Figures refer to direct spring - diaphragm actuators and the time to extend shaft, based upon 3-15 psi signal. 20 psi supply and a standard pilot size

**Note :** Increase stroking time by 15% for 6-30 psi spring range  
Shorter times achieved with high capacity pilot or with boosters

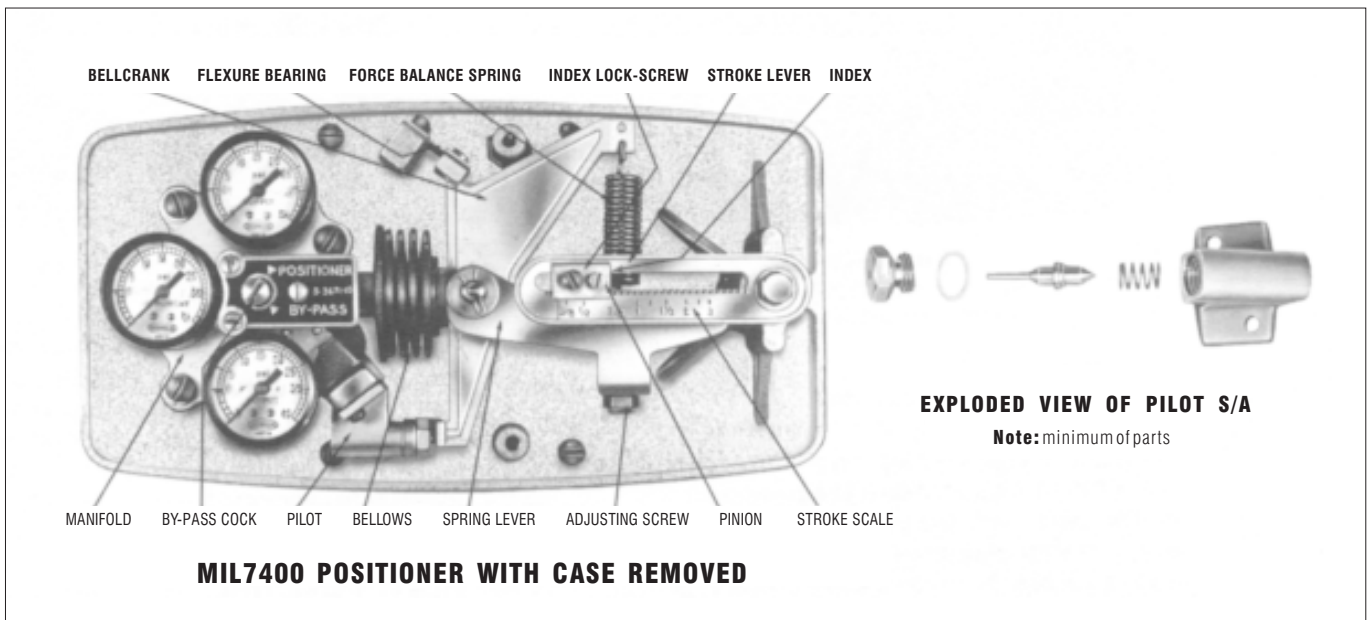
## Operation

The force balance system employed provides a linear relationship between valve position and controller output signal by converting stroke (a length) and force (pressure on a given area) to a common proportionality. The linear relationship is obtained by the comparison of the force derived from the controller output signal operating on the bellows and that derived from the effect of the valve stem movement on the force balance spring. The resultant of these two forces as interpreted by a "beam balance" lever, throttles the pilot to maintain the proportionality.



With the bypass set for "Positioner" the controller output pressure is applied to the bellows. When this pressure is increased, the bellows rotate the bellcrank lever on a frictionless flexure bearing, causing the pilot to increase the positioner output pressure (direct action pilot) or to decrease output pressure (reverse action pilot). The resultant valve stem motion is transmitted through the take off linkages and positioner levers, to the force balancing spring, loading or unloading it until the spring tension on the bell crank lever balances the opposing force of the bellows.

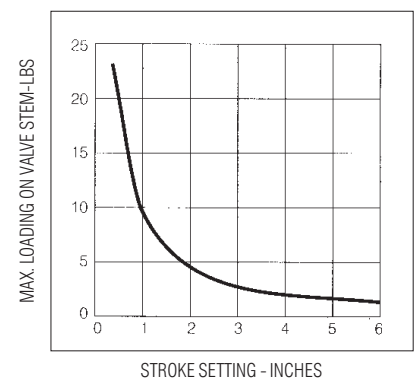
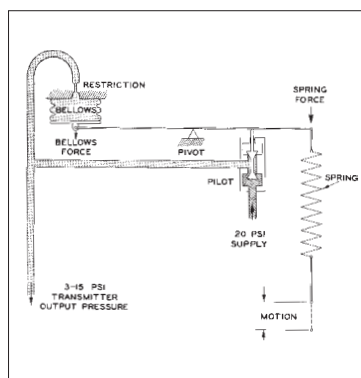
When these two forces are in balance, the system is in equilibrium, with the pilot throttling the output pressure to maintain equilibrium as the controller signal changes.



**Note:** Due to continuous product improvement, the specification / values are subject to change.

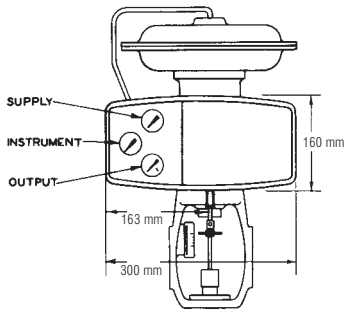
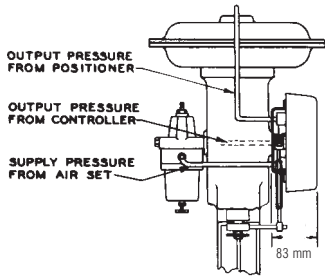
## Motion Transmitter

**MIL 1400 Motion Transmitter :** By modifying the porting of the air manifold and using a reverse action pilot, it is possible to convert a MIL 7400 positioner to a pneumatic motion transmitter. The output pressure from the transmitter then becomes directly proportional to valve stem position. The motion transmitter is illustrated above. A reduced capacity reverse action pilot is used and restriction is placed in the bellows inlet to obtain stability in the feedback action.

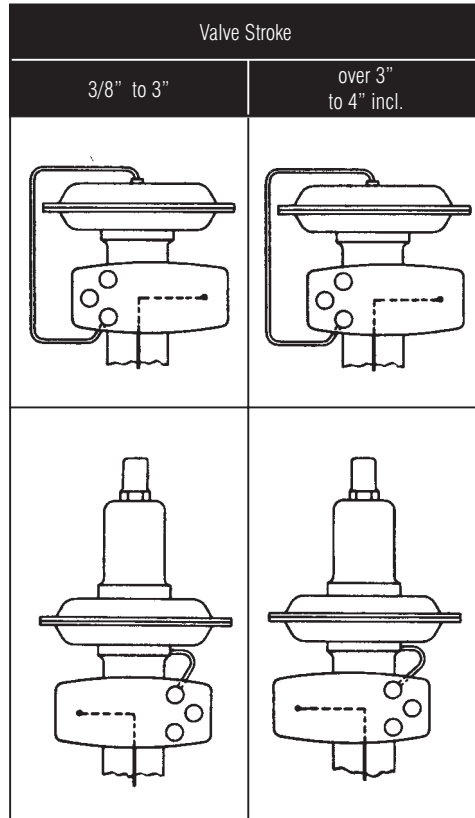


With different back lever lengths, it is possible to transmit motions from 3/4" to 4" and to convert them to a proportional 3-15 psi output pressure. The motion transmitter can be used on any application where there is sufficient positioning force available to overcome the force developed by the force balancing spring. A graph of the maximum force to actuate the transmitter for the various strokes is given above. (This force is the same as required to actuate the MIL 7400 Positioner with standard force balancing spring)

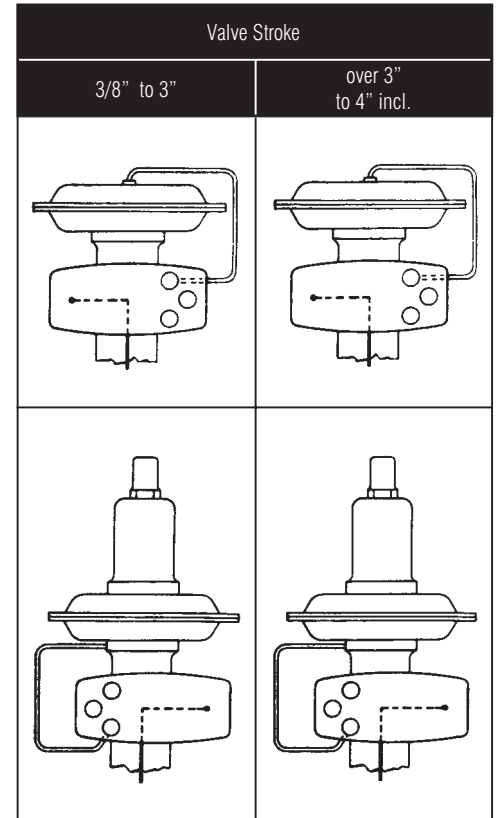
# Dimensions and Mounting orientations



## Direct Pilot Positioner Mounting



## Reverse Pilot Positioner Mounting



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