

ADPS2760-1

Rev 3

July 2005

Supersedes Rev 2

Custom Mounting Solutions for the SIPART® PS2 and ValvePAC™ Series 760 Valve Positioners

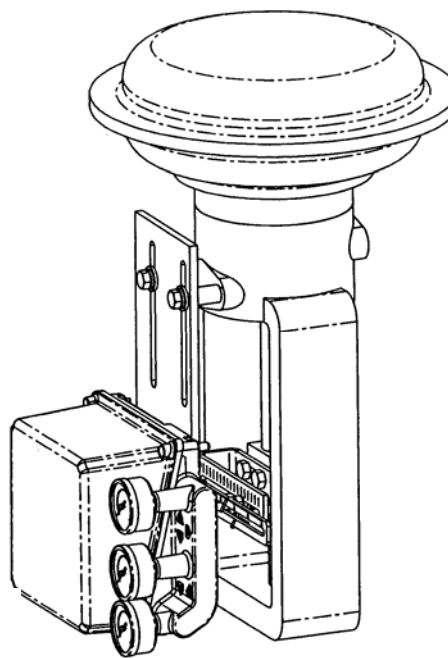
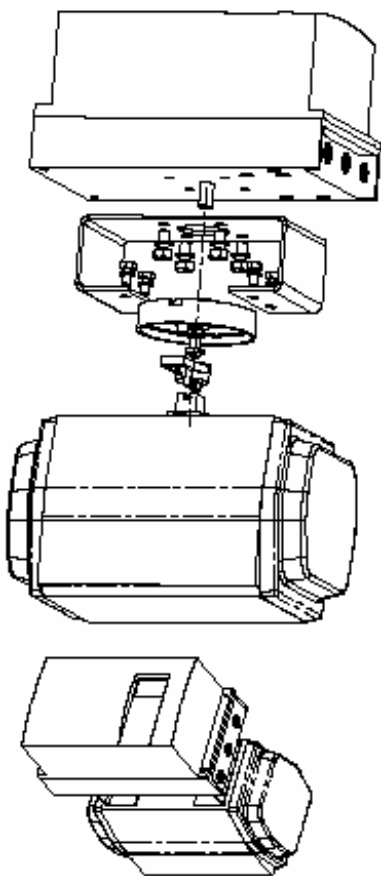


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PURPOSE

The purpose of this document is two-fold. First, for the user who would like Siemens to provide a custom bracket solution, this document will explain important design considerations and requirements. Second, this document provides the necessary details for users who wish to design and locally produce their own brackets.

INTRODUCTION

Installing a valve positioner on a valve actuator requires a mounting bracket and a dynamic coupling (feedback linkage). The mounting kit provides a secure, rigid mount for a valve positioner on a valve actuator. It also allows for the accurate transfer of the dynamic feedback signal from the actuator to the positioner, using coupling hardware that may also require some fabrication.

This document provides the background and guidelines for the design of a fixed bracket to secure a Siemens PS2 valve positioner (standard plastic, aluminum, or explosion proof housing) or a Series 760 valve positioner to any of several typical actuators. It also discusses the dynamic coupling between the actuator and positioner.

The majority of valve actuators may be organized into two types: rotary and linear, also known as “rising stem”. The valve actuator, through appropriate coupling hardware, must provide a dynamic feedback signal to the positioner. Both the actuator type and the positioner model must be considered when determining the coupling hardware needed for the coupling connection.

Electrical and/or pneumatic connections will also need to be made to the positioner and actuator. Refer to the positioner and actuator installation manuals for the details concerning these connections. Manuals for Siemens valve positioners, in PDF format, are available for download from the Siemens Internet site at <http://www.sea.siemens.com/ia>.

IMPORTANT

The mounting bracket must not interfere with the dynamic coupling or the electrical and pneumatic connections to the positioner and actuator.

A custom bracket can be designed by the installer to mount a given positioner on an actuator. Where several positioner models are used on site, it is often possible to design a common bracket that allows any of the positioners to mount on a given actuator.

Siemens Positioner Mounting Kits (Custom and Standard)

While a custom bracket and dynamic coupling can be designed by the installer to mount a given positioner on an actuator, it is often cost effective to purchase a Siemens Positioner Mounting Kit, standard or custom as needed. The kit will include a mounting bracket and, if needed, a dynamic coupling.

Siemens maintains a large inventory of mounting kits for a wide selection of valve actuators. A full list of these *existing* kits is available from your local Siemens representative. See the Product Support section later in this document to contact your local Siemens representative.

The Actuator Worksheets provided later in this Application Document (AD) are a convenient method for providing Siemens with the information needed to select or create mounting kits for your application. A convenient form is also provided to assist you in compiling and recording the information needed.

A Siemens designer will review the information on the form and worksheet and select the appropriate kit. If a kit does not exist, a custom kit can be provided.

PART 1: THE BASICS FOR ORDERING A CUSTOM KIT

This section will describe and illustrate the considerations and mechanical dimensions needed for the creation of a custom mounting kit. Actuator Worksheets at the end of this section provide a convenient means for recording the required dimensions.

ROTARY ACTUATORS

The goals when mounting a positioner on a rotary actuator are simple and straightforward:

- 1) Locate the positioner shaft above and in-line with the actuator shaft
- 2) Couple the positioner shaft to the actuator shaft
- 3) Accomplish goals 1 and 2 with a design solution that provides sufficient rigidity and minimizes backlash

NOTE

If your actuator conforms to the NAMUR (VDI/VDE 3845) standard, Siemens already stocks the kit you need. A list of kits is available from your local Siemens representative. See the Product Support section later in this document.

PS2 Valve Positioner

Figure 1 shows an exploded view of a PS2 positioner, a mounting bracket, a dynamic coupling and a sample rotary actuator (physical appearance varies with manufacturer).

PS2 rotary mounting solutions typically employ a shaft coupling kit (Siemens Part Number 6DR4004-8D, sold separately) that was originally designed for use with NAMUR-style actuators. This kit contains items 1-7 in Figure 1. The tongue on the feedback arm (item 4) engages the slot in the actuator shaft and is screwed in place. A pin in the wheel (item 3) engages this arm and transfers the actuator motion to the positioner.

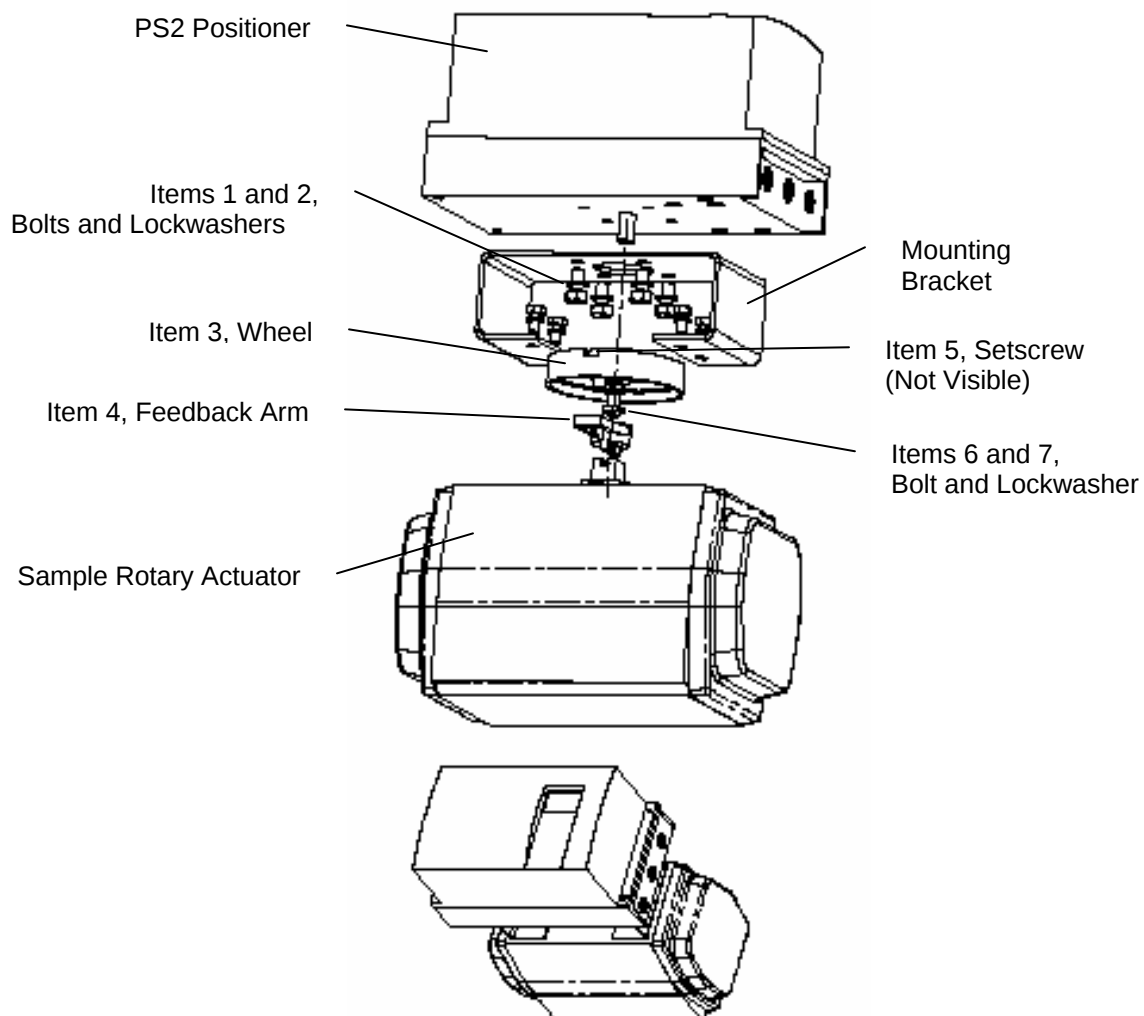
Figure 1 shows a NAMUR actuator. To use the PN 6DR4004-8D coupling with a non-NAMUR actuator, an intermediate adapter is needed. This adapter must connect the PN 6DR4004-8D coupling's NAMUR-style slot to the actuator's non-NAMUR shaft.

Design Inputs for Rotary Actuator Mounting Solutions

When requesting a custom solution, the following details are required:

- Location of mounting points for the positioner bracket
- Configuration of the actuator shaft
- Material preference if standard stainless steel (300 Series) or painted steel is unacceptable

Actuator Worksheets are provided later in this document.

**FIGURE 1 PS2 with Rotary Actuator**

760 Valve Positioner

Figure 3 shows an exploded view of a 760 positioner, a mounting bracket, a dynamic coupling, and a sample rotary actuator (physical appearance varies with manufacturer). The 760 has a variety of optional shaft configurations for non-NAMUR actuators, such as those with a 1/2" square drive. If an appropriate shaft is not available, then, like the PS2, a NAMUR shaft with an intermediate adapter is used.

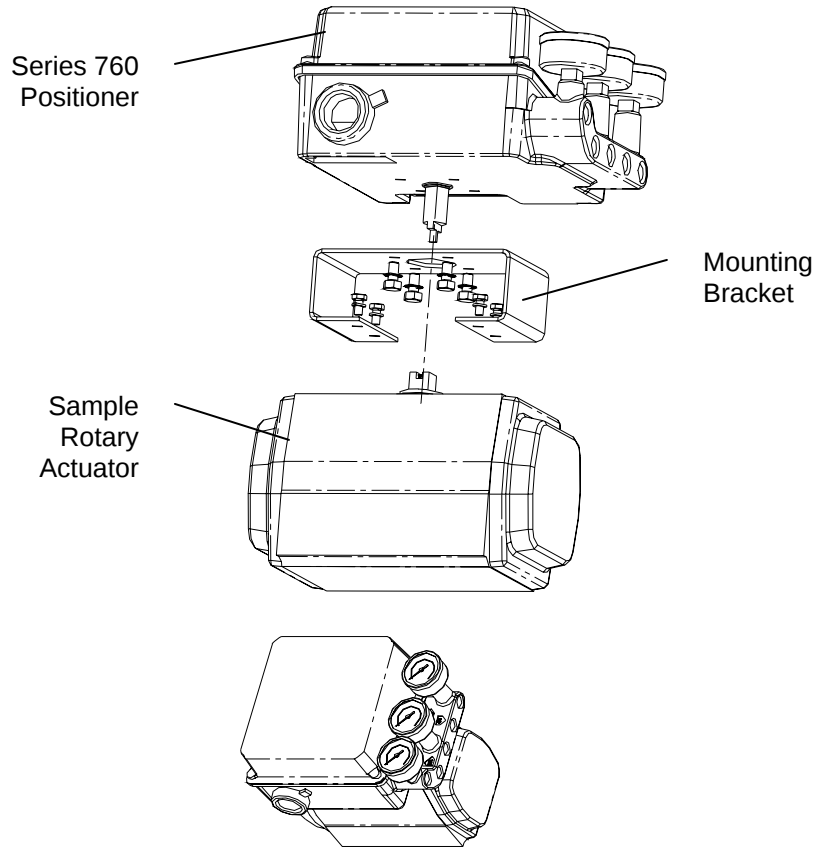


FIGURE 3 Series 760 with Rotary Actuator

Design Inputs for Rotary Actuator Mounting Solutions

When requesting a custom solution, the following details are required:

- Location of mounting points for the positioner bracket
- Configuration of the actuator shaft
- Material preference if standard stainless steel (300 Series) or painted steel is unacceptable

Actuator Worksheets are provided later in this document.

LINEAR ACTUATORS

The goals when mounting a positioner on a linear actuator are more involved than for a rotary actuator:

- 1) Either directly or with a bracket, attach a feedback pin to the actuator stem
- 2) Locate the positioner such that the feedback arm connects with the rest of the dynamic coupling, rotates the correct angle, and does not interfere with the actuator
- 3) Accomplish goals 1 and 2 with a design solution that provides sufficient rigidity and minimizes backlash

PS2 Valve Positioner

Figure 4 shows an exploded view of a PS2 and a sample linear actuator. A positioner bracket is used to rigidly mount the PS2 on the actuator. The dynamic coupling (feedback linkage in Figure 4) transfers actuator stem motion, a vertical motion as shown in the figure, to the positioner arm, which is clamped to the positioner input shaft.

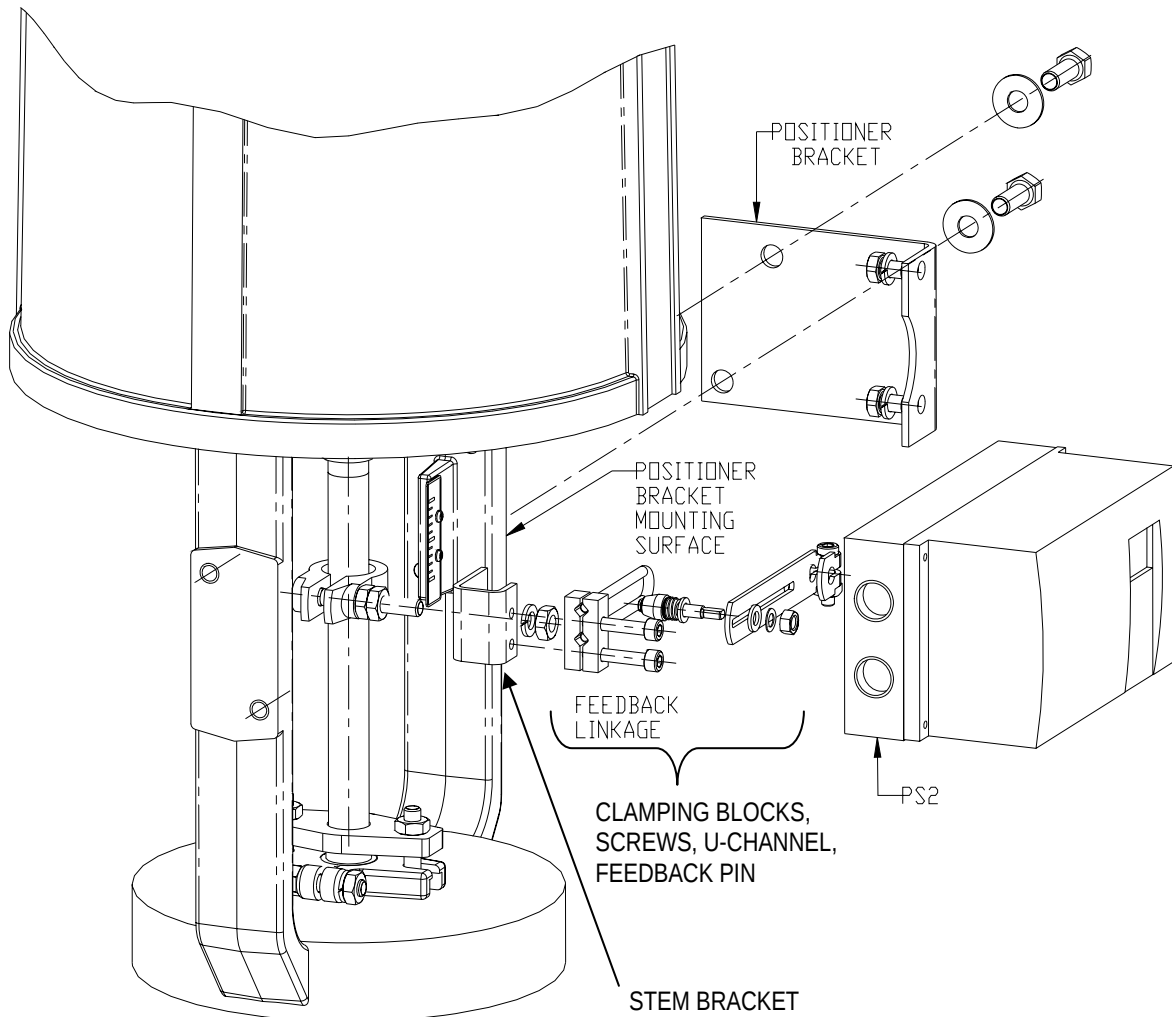
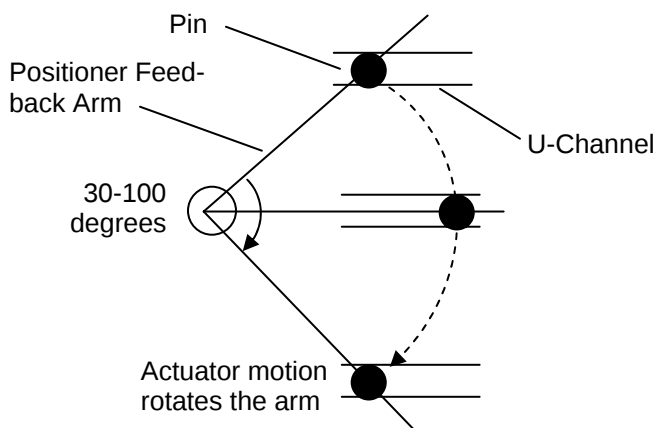


FIGURE 4 PS2 with Linear Actuator

A closer view of the PS2's dynamic coupling appears in the photograph below.

The positioner input shaft and feedback arm are on the left side of the photo. The actuator shaft, stem clamp, stem bracket, and U-channel are on the right side of the photo.

Actuator vertical motion is transferred to the positioner feedback arm through a spring-loaded pin; the spring eliminates backlash. The pin is fastened to the positioner arm but is allowed to move horizontally within the U-channel as the actuator stem rises and falls. This rotates the positioner arm through an arc, which also rotates the positioner input shaft, providing a mechanical feedback signal to the positioner. The PS2's feedback arm may rotate 30-100 degrees.



IMPORTANT: The positioner feedback arm must be perpendicular to the actuator stem at mid-stroke. Actuator dimensions, with the actuator stem at mid-stroke, are to be recorded on the appropriate Actuator Worksheet.

Two standard feedback arm lengths are shown in the following table. Other lengths are available as needed.

	Minimum Stroke (30 degrees)	Maximum Stroke (100 degrees)
35 mm arm	0.112 inches	2.111 inches
130 mm arm	0.509 inches	5.549 inches

Design Inputs for Linear Actuator Mounting Solutions

When requesting a custom solution, the following details are required:

- Location of mounting points for the positioner bracket
- Configuration of the actuator's stem clamp and position of the stem clamp relative to the positioner bracket mounting points
- Material preference if standard stainless steel (300 Series) or painted steel is unacceptable

Actuator Worksheets are provided in this document.

760 Valve Positioner

Figure 5 shows a Model 760 positioner mounted on a linear actuator. A bracket rigidly mounts the positioner on the actuator. The 760 uses an feedback arm and input shaft as its primary feedback device for linear applications. The feedback pin is fixed to the actuator stem clamp either directly or with a bracket. The pin slides inside the positioner feedback arm as the actuator stem moves. A formed wire clip on the arm ensures that there is no backlash between the pin and the rotating arm.

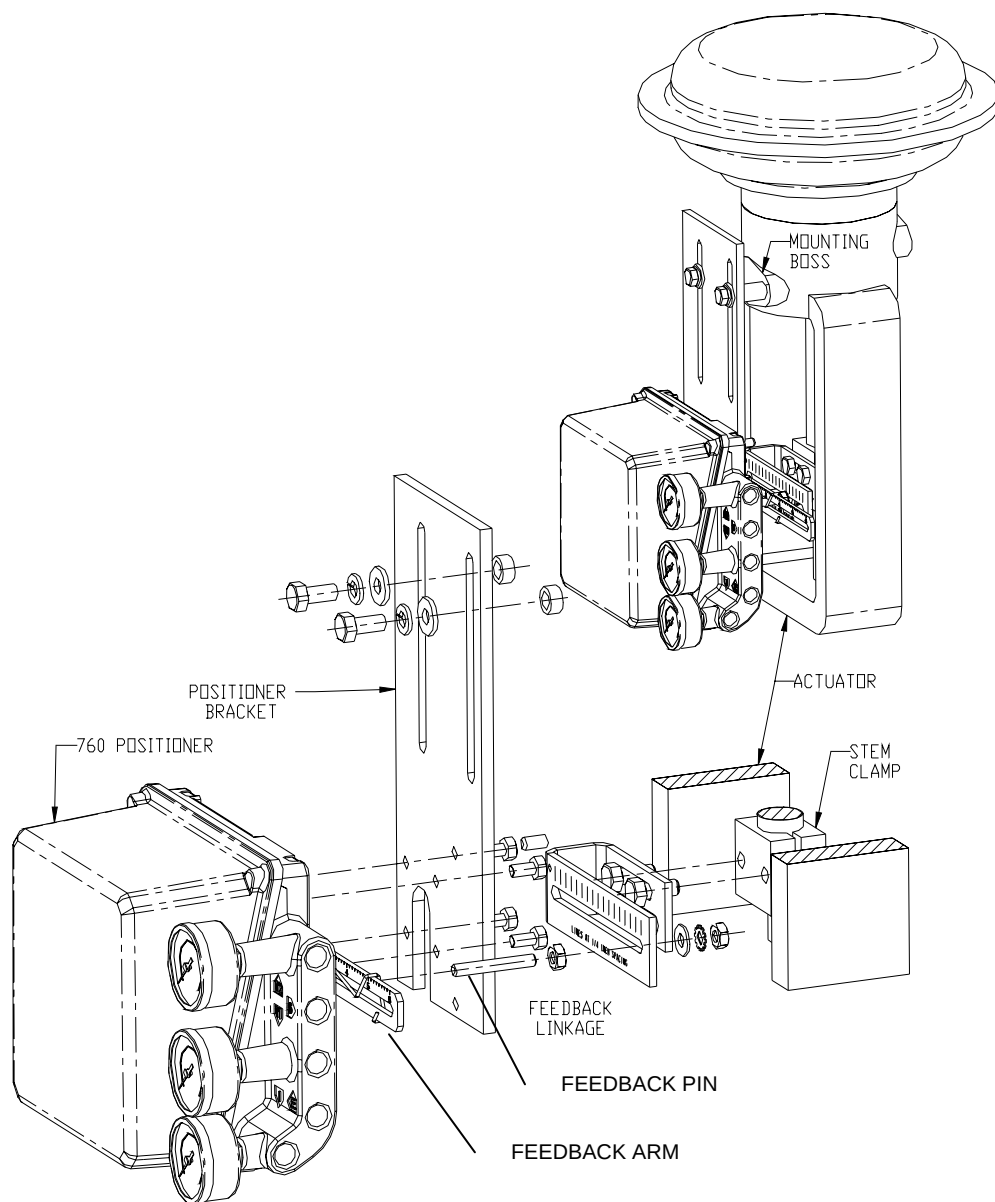
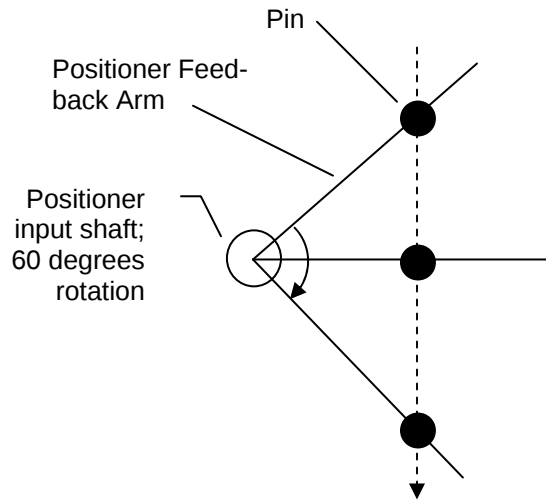


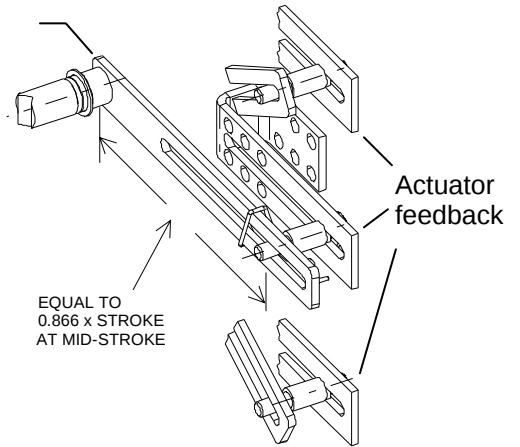
FIGURE 5 Series 760 with Linear Actuator

The standard 760 feedback arms must swing a total of 60 degrees for optimal linearity, as shown in the drawings below.



IMPORTANT: Positioner arm must be perpendicular to the actuator stem at mid-stroke. Actuator dimensions, with the actuator at mid-stroke, are to be recorded on the appropriate Actuator Worksheet.

Positioner input shaft and feedback arm; Series 760 shown



PREFERRED METHOD OF STROKE SETTING FOR FEEDBACK PIN CONNECTION. FEEDBACK LEVER SHOWN AT MID-STROKE.

Design Inputs for Linear Actuator Mounting Solutions

When requesting a custom solution, the following details are required:

- Location of mounting points for the positioner bracket
- Configuration of the actuator's stem clamp and position of the stem clamp relative to the positioner bracket mounting points
- Material preference if standard stainless steel (300 Series) or painted steel is unacceptable

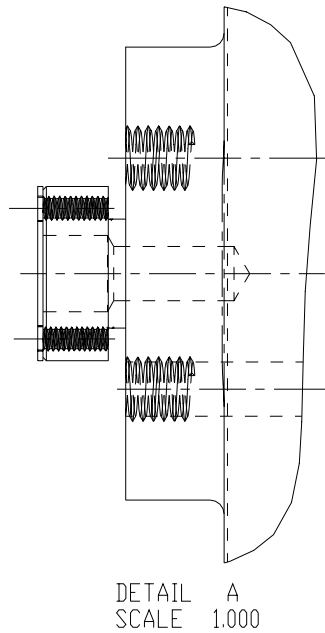
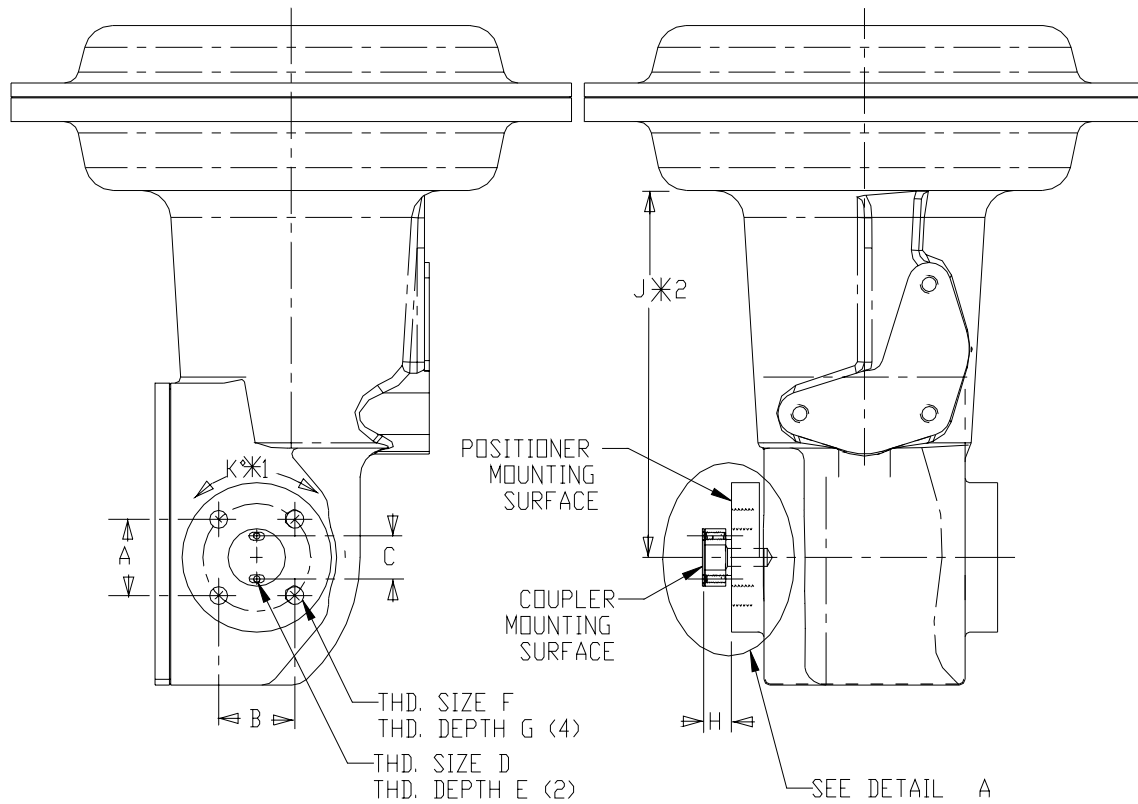
Actuator Worksheets are provided in this document.

ACTUATOR WORKSHEETS

The following pages contain a wide variety of different actuator configurations. Select the actuator configuration that best represents your application and enter the requested data in the table on that page. Every effort has been made to include all the critical details so the design process can be as efficient as possible. Contact Siemens if your application cannot be fairly represented by any of these choices. Photographs are always encouraged.

The following form is provided to assist you in organizing needed information before contacting Siemens. Send the completed form and worksheet to the address given below.

Request a Custom Bracket or Dynamic Coupling Kit	
Your Name:	
Your Job Title:	
Company Name:	
Street or P.O. Box:	
City, State, and ZIP:	
Country:	
Telephone Number:	Extension:
FAX Number:	
Email Address:	
Your Purchase Order No.	
Positioner Model Number:	
Actuator Manufacturer:	
Actuator Model:	Size:
Other Pertinent Information: List included photos, drawings, or other material and whether these are to be returned to you. Send completed form and Actuator Worksheet to: Siemens Energy & Automation Attn: Inside Sales 1201 Sumneytown Pike, Box 900 Spring House, PA 19477-0900 (215)-646-7400 ext. 4993 Fax: (215)-646-3547	



* 1 DEGREES OF ROTATION.

* 2 MINIMUM HEAD ROOM BETWEEN
 C OF SHAFT & NEAREST OBSTACLE
 AT LEVEL OF POSITIONER
 MOUNTING SURFACE

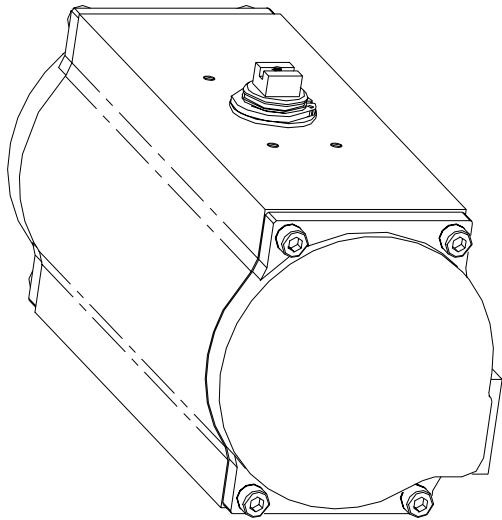
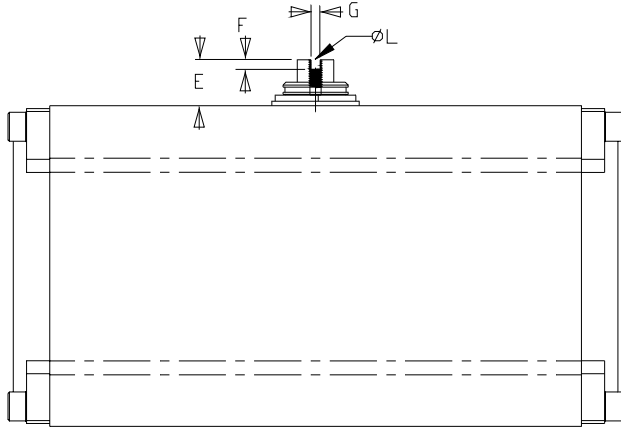
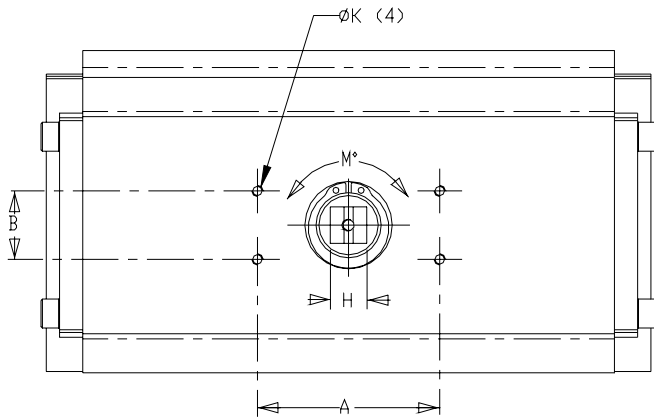
DIM.	VALUE
A	
B	
C	
D	
E	
F	
G	
H	
J	
K°	

Unless otherwise specified,
 materials may include
 painted steel or 300-series
 stainless. Note here if you
 have a specific requirement.

WORKSHEET 1 Rotary Actuator 1 Dimensions

DIM.	VALUE
A	
B	
E	
F	
G	
H	
M°	
ØJ	
ØK	
ØL	

Ø= THREAD SIZE AND DEPTH



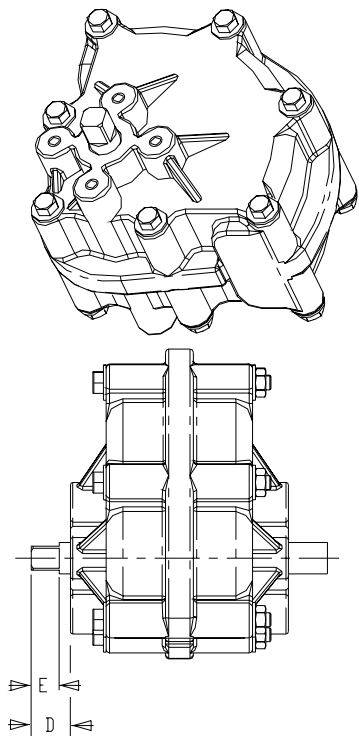
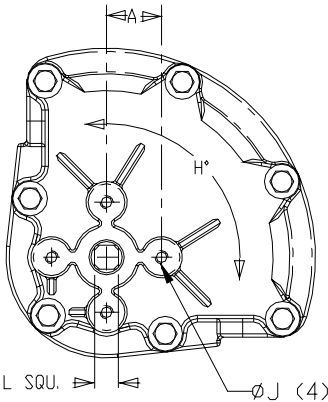
Unless otherwise specified,
materials may include
painted steel or 300-series
stainless. Note here if you
have a specific requirement.

WORKSHEET 2 Rotary Actuator 2 Dimensions

DIM.	VALUE
A	
D	
E	
F	
H°	
L	
ØJ	

Ø= THREAD SIZE AND DEPTH
WHERE APPLICABLE

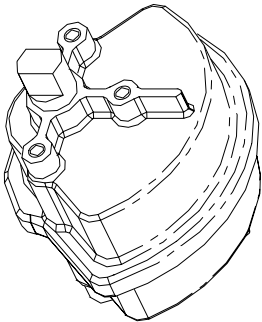
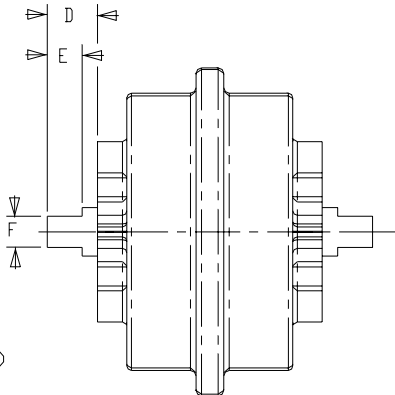
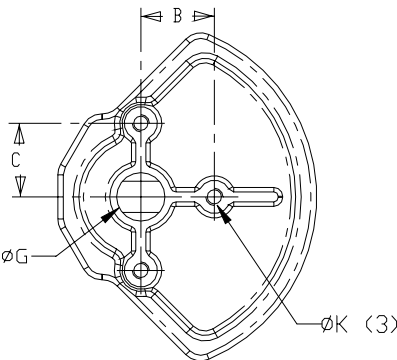
VERSION
A



DIM.	VALUE
B	
C	
D	
E	
F	
H°	
L	
ØG	
ØK	

Ø= THREAD SIZE AND DEPTH
WHERE APPLICABLE

VERSION
B



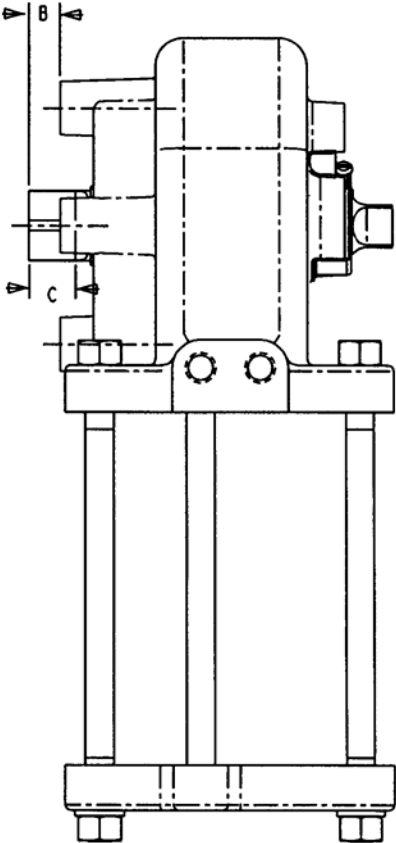
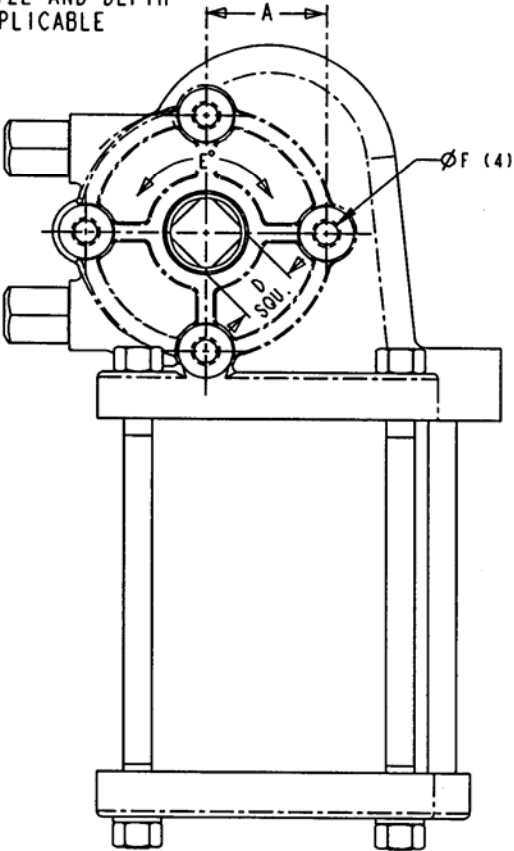
Unless otherwise specified,
materials may include painted
steel or 300-series stainless.
Note here if you have a
specific requirement.

WORKSHEET 3 Rotary Actuator 3 Dimensions

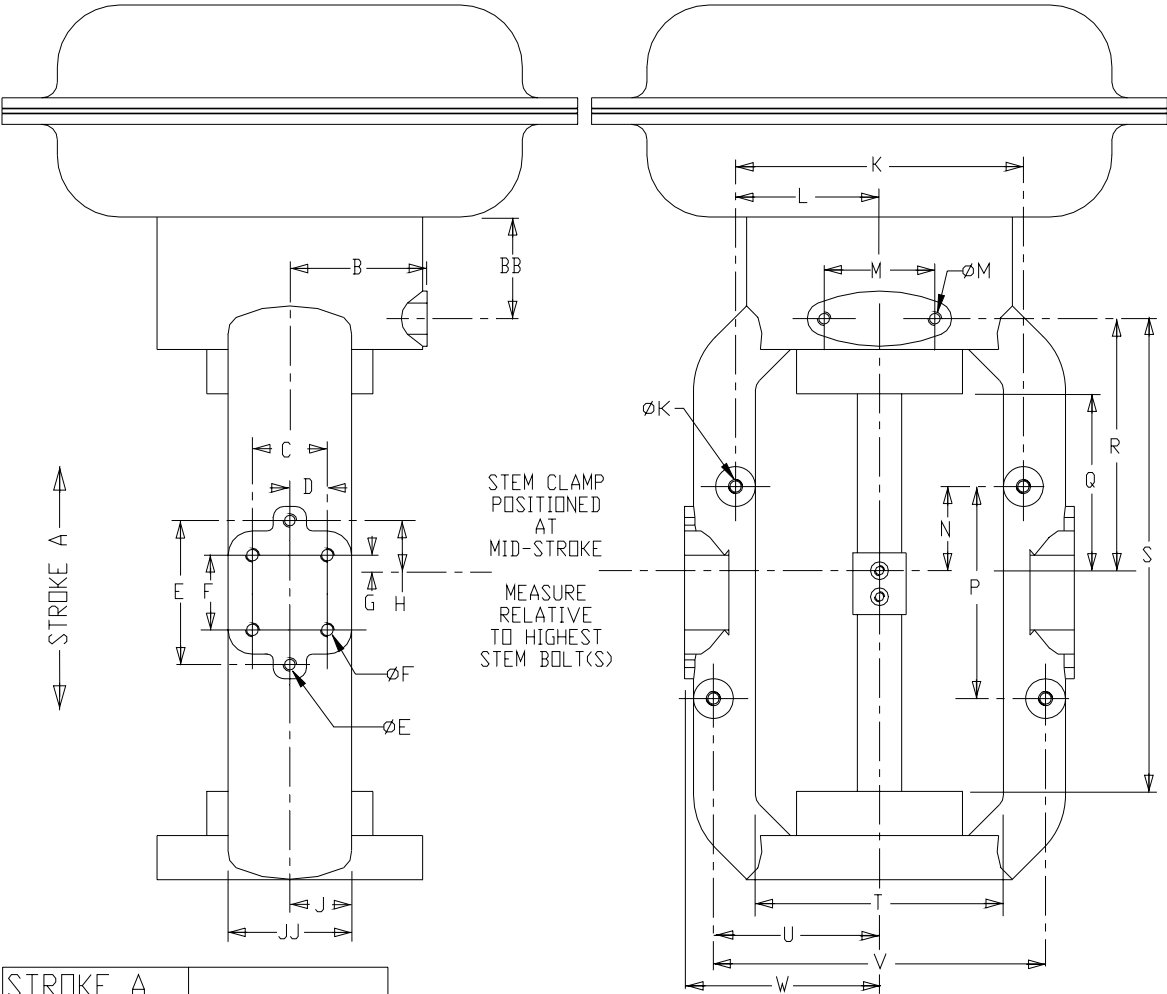
DIM.	VALUE
A	
B	
C	
D	
E°	
Ø F	

Unless otherwise specified, materials may include painted steel or 300-series stainless. Note here if you have a specific requirement.

Ø = THREAD SIZE AND DEPTH
WHERE APPLICABLE



WORKSHEET 4 Rotary Actuator 4 Dimensions



STROKE A			
DIM.	VALUE	DIM.	VALUE
B		J	
BB		JJ	
C		ØE	
D		ØF	
E			
F			
G *			
H *			

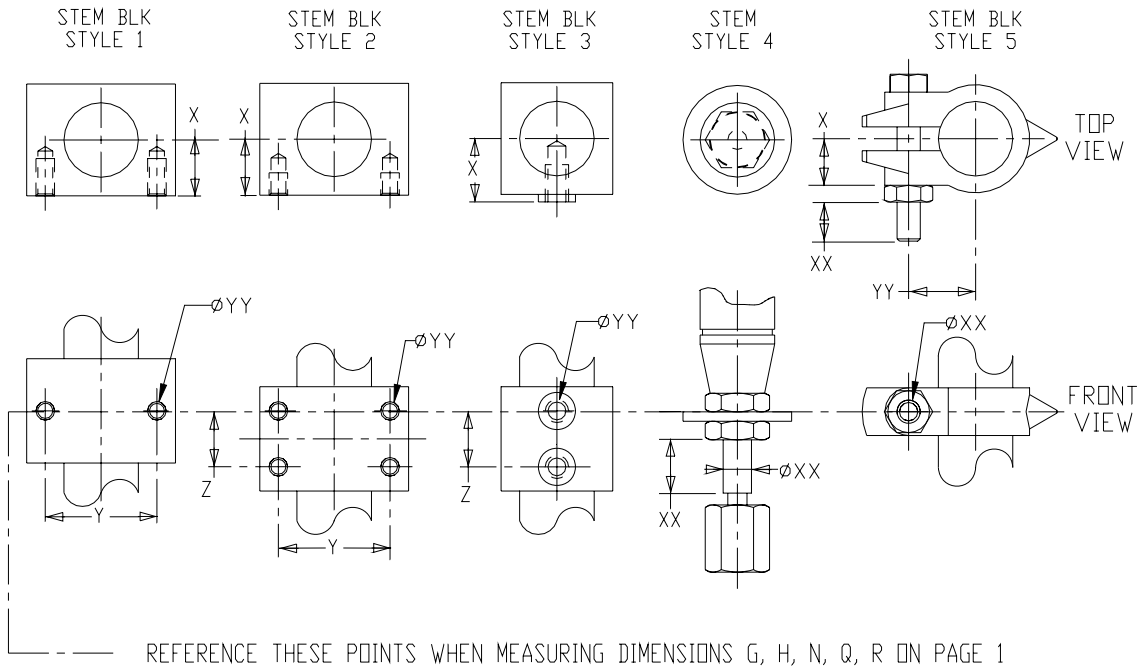
- NOTES:
- 1) Ø = THREAD SIZE AND DEPTH
 - 2) * = MEASURE WITH ACTUATOR POSITIONED AT MID-STROKE
 - 3) NOT ALL FEATURES SHOWN APPEAR IN EVERY ACTUATOR. MEASURE ONLY THOSE FEATURES THAT APPLY TO YOUR ACTUATOR

DIM.	VALUE	DIM.	VALUE
K		T	
L		U	
M		V	
N *		W	
P		ØK	
Q *		ØM	
R *			
S			

Unless otherwise specified, materials may include painted steel or 300-series stainless. Note here if you have a specific requirement.

WORKSHEET 5a Linear Actuator Dimensions
See Worksheet 5b for actuator stem dimensions.

PLEASE CIRCLE YOUR STEM CLAMP OR PROVIDE A SKETCH / PHOTOGRAPH WITH DIMENSIONS



Ø = THREAD SIZE AND
THREAD DEPTH / LENGTH
WHERE APPLICABLE

SHEET 2 OF 2

DIM.	VALUE
X	
XX	
Y	
YY	
Z	
ZZ	
ØXX	
ØYY	

WORKSHEET 5b Linear Actuator Stem Dimensions
See Worksheet 5a for actuator body dimensions.

PART 2: DETAILS FOR DESIGNING A MOUNTING KIT

This section describes the steps needed to design a mounting kit. The dynamic coupling (feedback linkage) is also described.

ROTARY ACTUATORS – PS2 AND 760

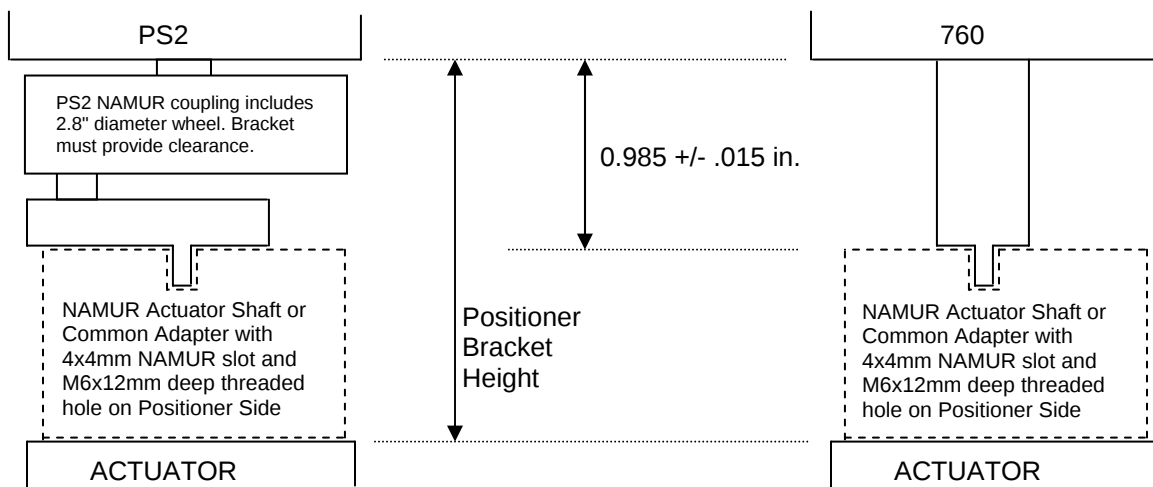
As stated in Part 1, the goals for designing a rotary mounting solution are:

- 1) Locate the positioner shaft above and in-line with the actuator shaft
- 2) Couple the positioner shaft to the actuator shaft
- 3) Accomplish goals 1 and 2 with a design solution that provides sufficient rigidity and minimizes backlash

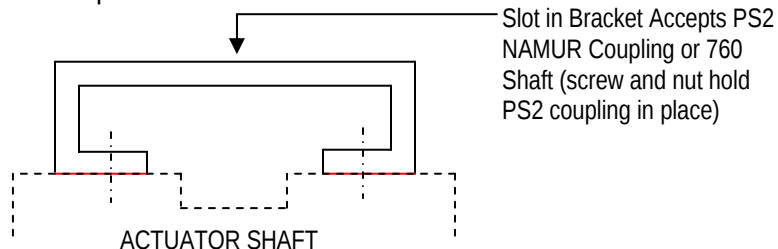
The PS2's available NAMUR coupling kit (Siemens PN 6DR4004-8D), intended for NAMUR actuators, can be used with other rotary actuators if an intermediate adapter is added.

A 760 can be ordered with a NAMUR shaft or an optional shaft configuration, such as 1/2" square drive, to accommodate a non-NAMUR actuator. Where the positioner and actuator have different shaft configurations, they can be coupled together with an intermediate adapter.

To minimize inventory and design costs, the best solution is to design a kit that can be used with EITHER positioner. The key is the PS2's NAMUR coupling and the 760's NAMUR shaft. Relative to the positioner mounting surface, the tongues on the PS2 adapter and 760 NAMUR shaft are located identically. If the actuator shaft is NAMUR, then both positioners can directly engage the actuator. If the actuator shaft is a different style, then a common intermediate adapter will allow both instruments to connect to the actuator. A common mounting solution requires that the distance between the positioner and the top surface of the mating part (adapter if the actuator is not NAMUR) must be as shown below:



One example of such an adapter is a simple bent sheet metal bracket:



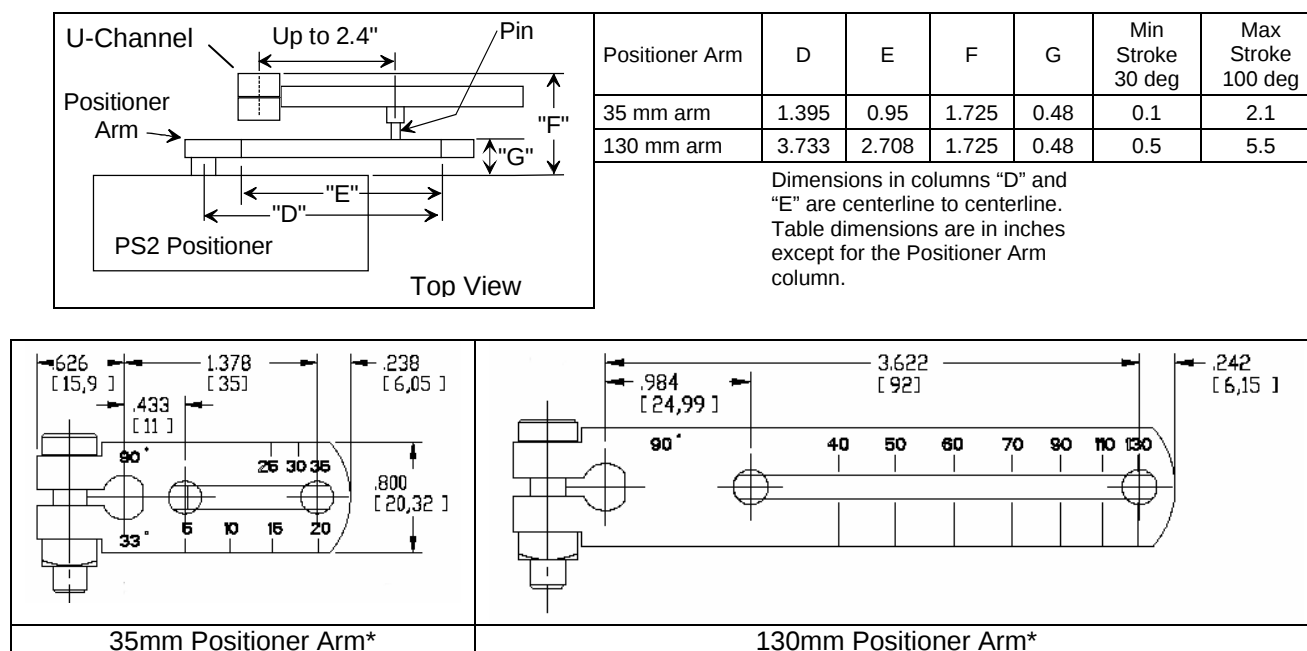
LINEAR ACTUATORS

PS2 Valve Positioner

As shown on page 8, the PS2 uses a U-channel that is attached to the actuator stem, usually at the stem clamp. A pin, fixed to the PS2's feedback arm, slides inside this channel as the actuator moves and translates the actuator position to the positioner. The challenge is to mount the positioner to the actuator and the U-channel to the stem in such a way that:

- The PS2 and the U-channel are both secure
- The pin moves freely inside the U-channel throughout the actuator's full stroke
- The PS2 arm and the U-channel do not interfere with the actuator yoke
- The spring compression on the pin's plastic tip is adequate (approximately ¼ inch) to prevent backlash
- The PS2 feedback arm is perpendicular to the actuator stem at mid-stroke
- The PS2 arm rotates no less than 30 degrees and no more that 100 degrees (60 degrees typical)

The available feedback arms are shown in Figure 6. A feedback arm is chosen depending upon actuator stroke and available space. Occasionally the "F" dimension (see the positioner sketch in Figure 6) is too small to allow the arm to swing freely. A shaft extension can be added to the PS2 shaft to increase this dimension. Extensions are available from Siemens.



* Positioner arm dimensions are in inches [mm]

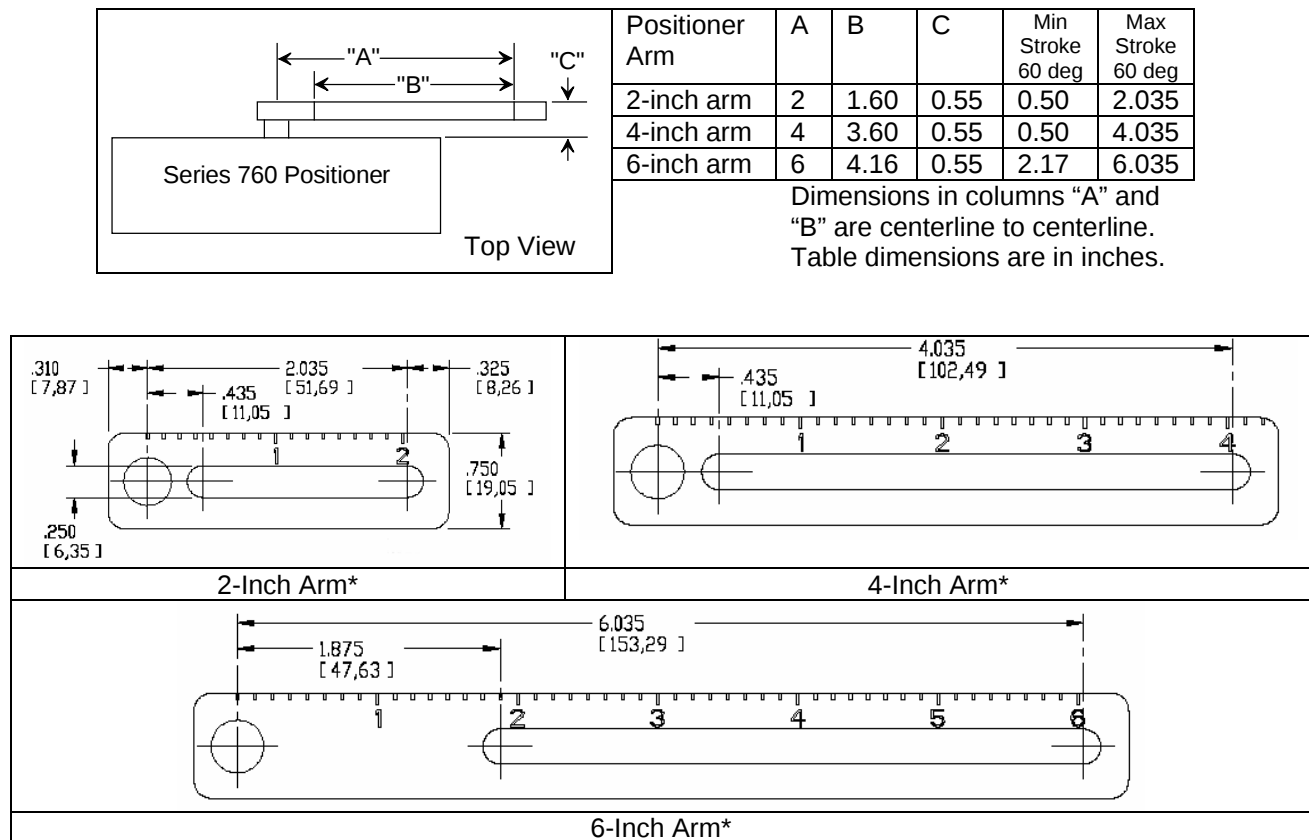
FIGURE 6 PS2 Positioner Arms

760 Valve Positioner

As shown on page 10, the 760 requires (for optimal linearity) that its feedback pin be fixed to the actuator stem, usually at the stem clamp. This pin slides inside a slot in the 760's feedback arm as the actuator moves, translating the actuator position to the positioner. The challenge is to mount the positioner to the actuator and the feedback pin to the stem in such a way that:

- The 760 and the feedback pin are both secure. Note that the 760's internal range spring applies force to the arm and the pin.
- The pin moves freely inside the arm throughout the actuator's full stroke
- The 760 feedback arm and the stem bracket do not interfere with the actuator yoke
- The pin remains in contact with the anti-backlash wire throughout the stroke to minimize backlash (a consideration only if designing for strokes over the standard 6-inch limit)
- The 760 arm is perpendicular to the actuator stem at mid-stroke
- The 760 arm rotates 60 degrees

The available feedback arms are shown in Figure 7. A feedback arm is chosen depending upon actuator stroke and available space. Occasionally the "C" dimension (see the positioner sketch in Figure 7) is too small to allow the arm to swing freely. A longer 760 shaft is available.



* Other positioner feedback arm lengths available. Arm dimensions are in inches and [mm].

FIGURE 7 Series 760 Standard Feedback Arms

POSITIONER DIMENSIONS

Figures 8, 9, and 10 show the physical dimensions of currently available PS2 positioners. Each positioner has multiple mounting-hole patterns for convenience, including standard NAMUR hole spacing. Figure 11 shows the 760 positioner dimensions. The 760's primary mounting holes are arranged in the standard NAMUR hole pattern. As an alternative, two extra holes are available to accept an optional bracket, which offers additional flexibility. In all cases, note the location of the air ports and the size of the positioner to avoid any interference with the actuator or surrounding objects.

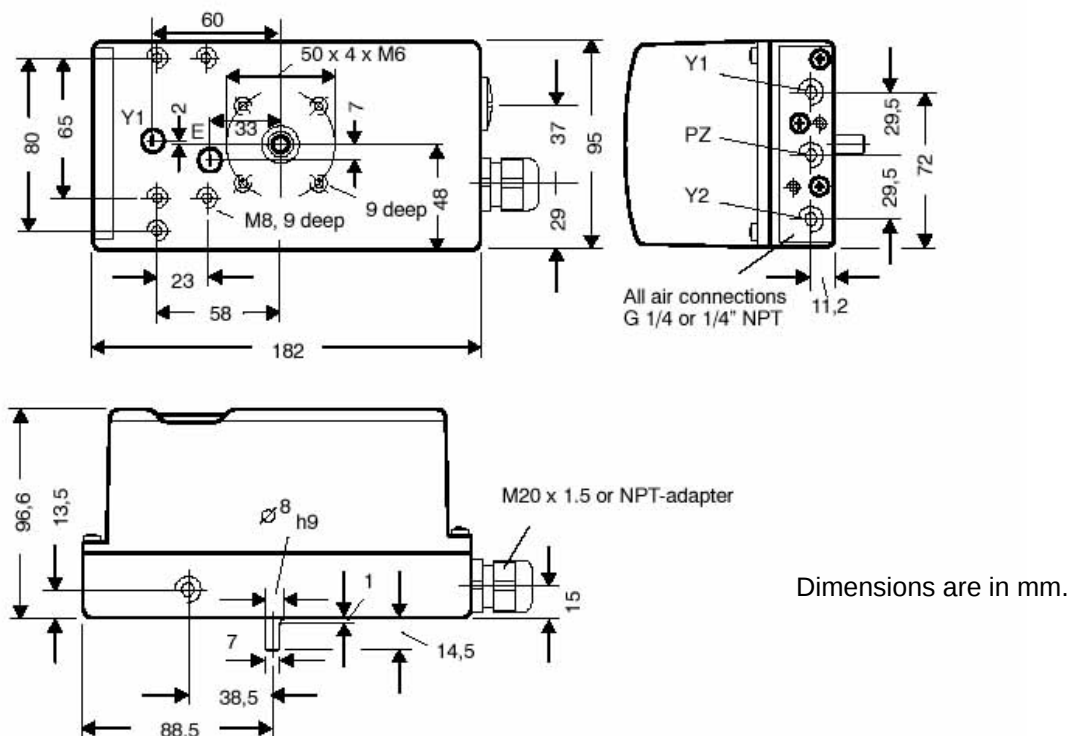


FIGURE 8 PS2 Dimensions, Plastic Enclosure

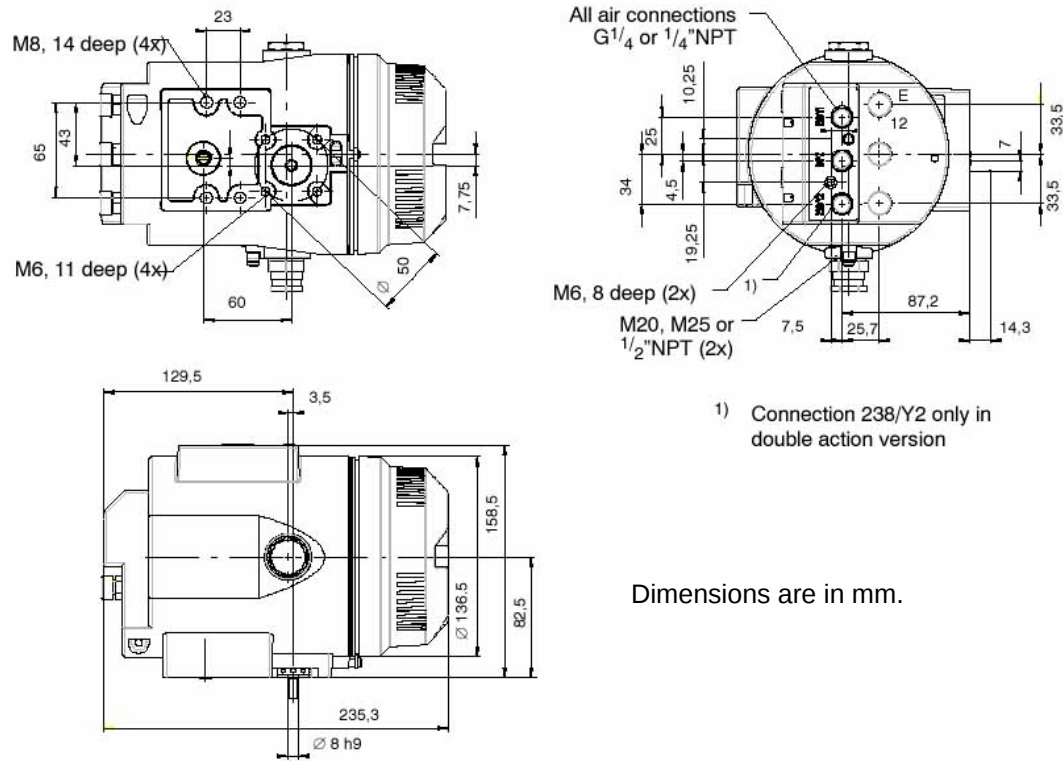


FIGURE 9 PS2 Dimensions, Explosion/Flame-Proof Enclosure

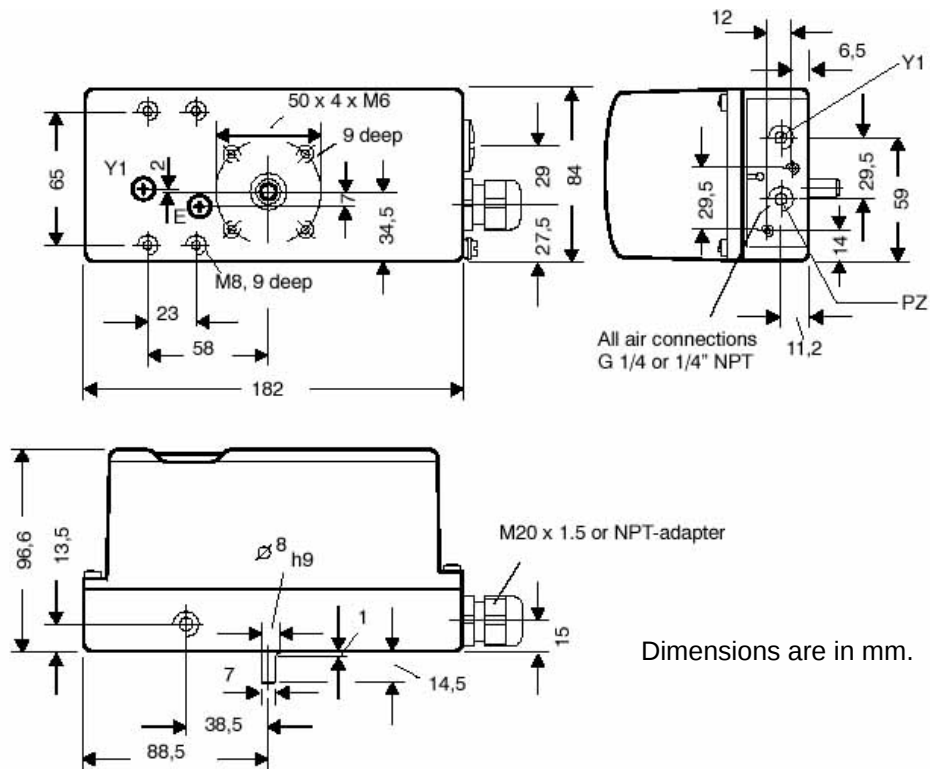


FIGURE 10 PS2 Dimensions, Aluminum Enclosure

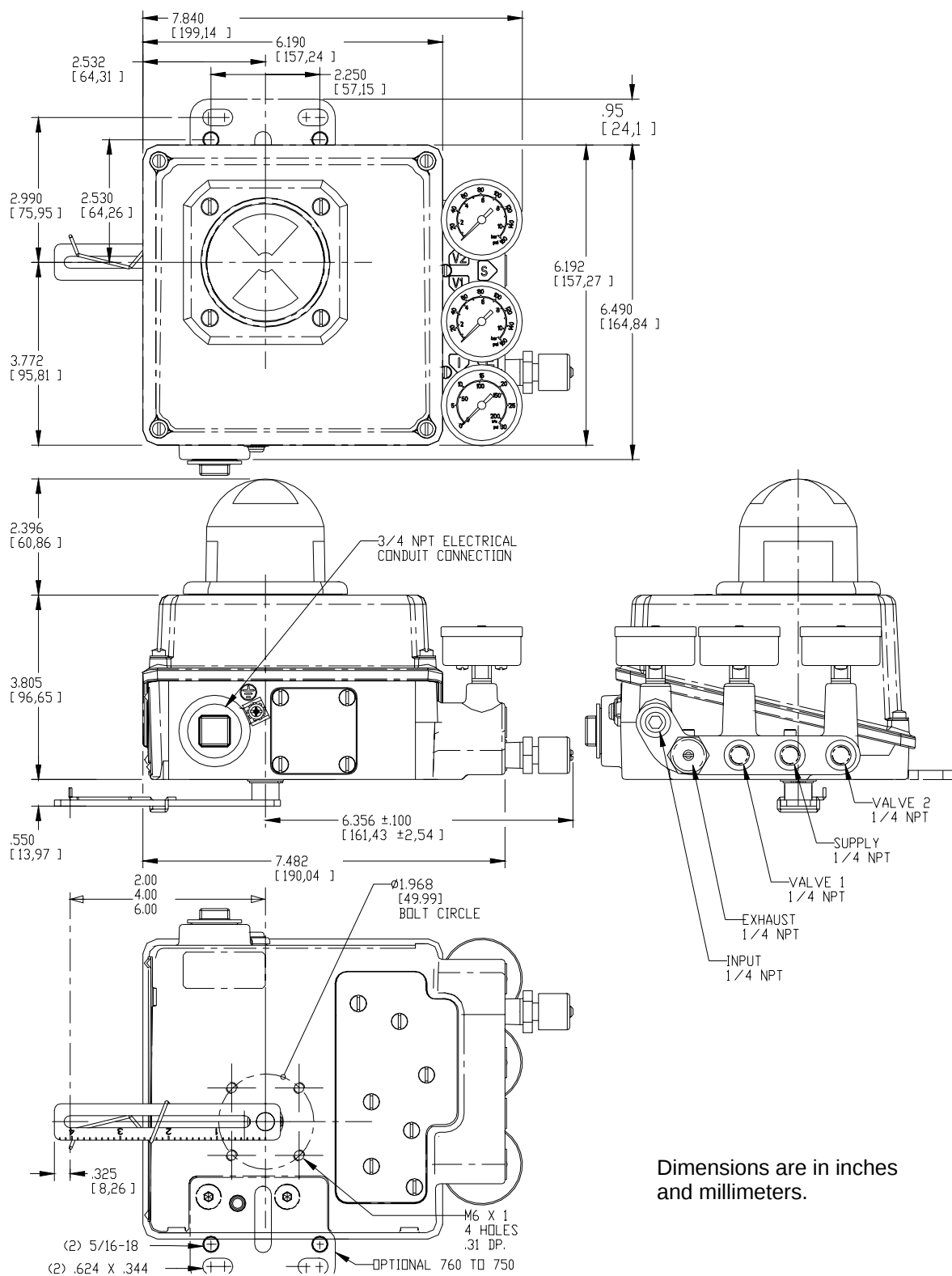


FIGURE 11 Series 760 Dimensions (Optional Beacon and Gauges Shown)

PRODUCT SUPPORT

This section provides the Internet site addresses, e-mail addresses, telephone numbers, and related information for customers to access Siemens product support.

When contacting Siemens for support:

- Please have complete product information at hand:
 - For hardware, this information is provided on the product nameplate (part number or model number, serial number, and/or version).
 - For most software, this information is given in the Help > About screen.
- If there is a problem with product operation:
 - Is the problem intermittent or repeatable? What symptoms have been observed?
 - What steps, configuration changes, loop modifications, etc. were performed before the problem occurred?
 - What status messages, error messages, or LED indications are displayed?
 - What troubleshooting steps have been performed?
 - Is the installation environment (e.g. temperature, humidity) within the product's specified operating parameters? For software, does the PC meet or exceed the minimum requirements (e.g. processor, memory, operating system)?
- A copy of the product Service Instruction, User's Manual, or other technical literature should be at hand. The Siemens public Internet site (see the table) has current revisions of technical literature, in Portable Document Format, for downloading.
- To send an instrument to Siemens for repair, request a Return Material Authorization (RMA).



IMPORTANT

An instrument must be thoroughly cleaned (decontaminated) to remove any process materials, hazardous materials, or blood born pathogens prior to return for repair. Read and complete the Siemens RMA form(s).

TABLE 1.1 Contact Information

NORTH AMERICA	Telephone	+1 800 569 2132, option 2 for Siemens-Moore brand instruments
	Fax	+1 215 283 6358
	E-mail	PITechSupp@sea.siemens.com
	Hours of Operation	8 a.m. to 6 p.m. eastern time Monday – Friday (except holidays)
	Public Internet Site	www.sea.siemens.com/ia/
	Repair Service	+1 215 646 7400 extension 3187

For contact information outside North America, visit the Siemens public Internet site www.sea.siemens.com/ia/, locate "Customer Support Process Instrumentation," and click on the Contact Tech Support link to access the Global Support link.

