

SMP Series 4-20mA Proportional Rotary Servo

Instruction Manual

General

The SMP servo is a 120 Vac rotary actuator with a 4-20mA input Positioner, 4-20mA feedback output, and can include these options: a) mounting bracket and/or b) (2) auxiliary position switches.

The servo is shipped with limit switches and positioner set for a 90 degree rotation in the 3 o'clock to 6 o'clock sector (viewed from the PC board side). The servo can be field re-configured for a stroke as small as 45 degrees or as large as 135 degrees. The stroke can be anywhere within the 284 deg. range shown below. The stroke can NOT include the "Forbidden Zone".

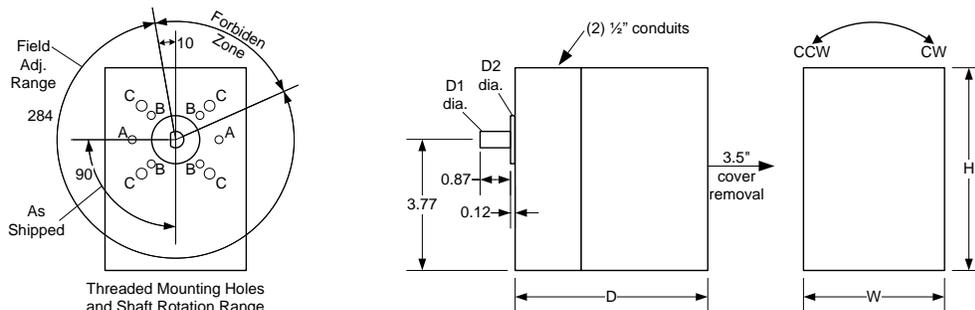
Ratings

Torque: See Table 1
 Stroke: 45-135 degrees.
 Power: 120 Vac, 60 Hz, 1 ph., VA: See Table 1
 Input: 4-20mA or 1-5Vdc, field selectable
 Output: 4-20mA position feedback, internally powered, 600 ohm max load
 Aux Switches: (2) Open and Closed, adjustable, 120Vac/6.5A
 Environment: Nema 12, 32-122F (0-50C)

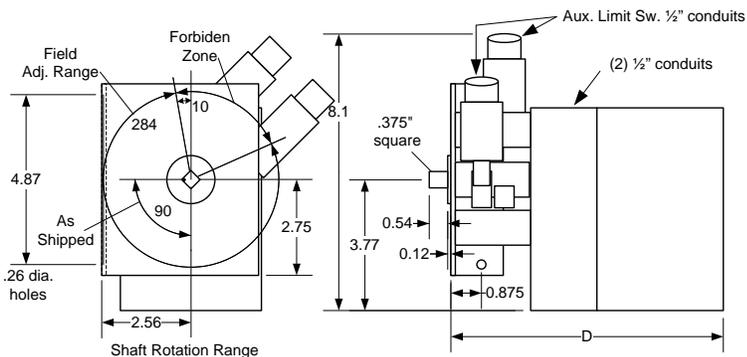
Table 1 Dimensions and Ratings Threaded Mounting Holes

Model	Torque	VA	H	W	D	D1	D1	Hole	Thd.	BC
SMP-03	3 ft-lb	7	5.82"	4.05"	5.53"	8mm	12mm	A	6mm	2.50"
SMP-15	15 ft-lb	13	5.82"	4.05"	5.53"	12mm	35mm	B	6mm	1.97"
SMP-37	37 ft-lb	23	6.65"	4.87"	5.53"	12mm	35mm	C	8mm	2.76"
SMP-15..S2-M1	15 ft-lb	13	5.82"	4.05"	5.53"	12mm	35mm	B	6mm	1.97"
SMP-37..S2-M1	37 ft-lb	23	6.65"	4.87"	5.53"	12mm	35mm	C	8mm	2.76"

Note: SMP-37 units also have 'B' holes



SMP-xx (xx = 03, 15, or 37) without aux limit switches or mounting bracket



SMP-xx-30-2-5k-E1-S2-M1 (xx = 15 or 37) with aux limit switches and mounting bracket

Installation

Mount in an indoor location that will not be exposed to excessive vibration or hose-down water sprays.

Mounting

Securely attach the SMP-xx to a rigid foundation. When the servo shaft is coupled to a damper, valve, etc...shaft alignment is very important. Misaligned shafts can stall the servo, cause accelerated wear, and can loosen rigid couplings. Use clamp-plate style couplings on the servo shaft 'flat' to prevent slippage.

WARNING

The servo output shaft can move unexpectedly.

Keeps hands, arms, legs, feet, head, etc.. away from moving parts at all times.
Before applying power, disconnect the lever arm and linkage to prevent injury, or damage, when the servo moves.

Wiring

Connect 120Vac to the "AC HOT" and "AC NEU" terminal on the positioner board. Connect the safety ground to the SMP-xx green wire.

Provide a local 120Vac power disconnect to prevent injury or damage during setup, maintenance, and repairs.

Connect a powered 4-20mA (or 1-5Vdc) position command signal to the positioner terminals:
INPUT 4-20 + and 4-20 -.

Optionally, connect the position feedback OUTPUT 4-20+ and 4-20- positioner terminals to the control system in order to monitor the SMP-xx operation. The Output 4-20mA loop is powered by the positioner board's internal 24 Vdc supply.

Note: The Input 4-20- and Output 4-20- terminals are connected together inside the positioner board.

Auxiliary position switches wire color code:

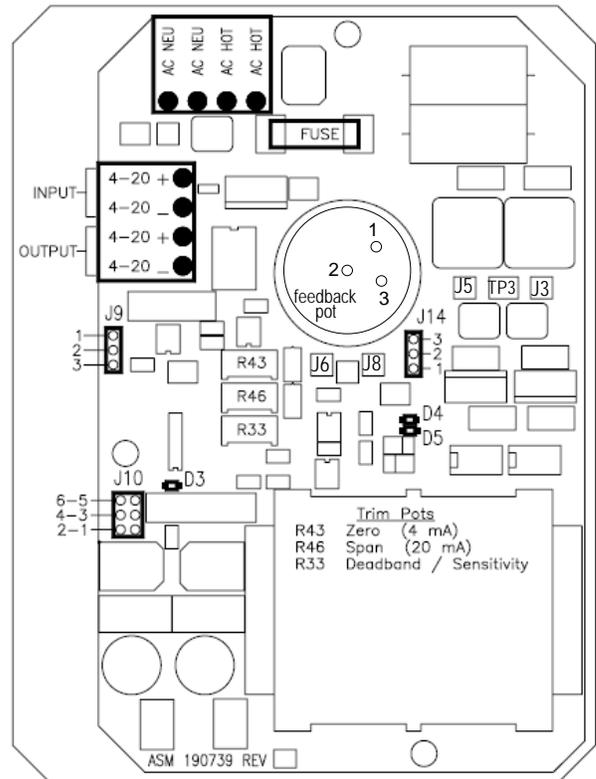
- Red: Common for both switches.
- Brown: Switch makes near full CCW.
- Yellow: Switch makes near full CW.

See the dimension drawing for the definition of the CW and CCW directions.

4mA Rotation Direction

The 4mA rotation direction is noted on the label inside the positioner. See the dimension drawing on page 1 for the definition of the CW and CCW directions.

The 4mA rotation direction was established during order entry and is determined by the positioner-to-motor internal wiring.



4 mA ROTATION = _____ (CCW or CW)	
JUMPER - J9	
1-2	= 4-20 mA INPUT SIGNAL
2-3	= 1-5 V INPUT SIGNAL
JUMPER - J14	
IF FEED BACK POT WIPER FAILS:	
1-2	= DRIVE TOWARD 4 mA
2-3	= DRIVE TOWARD 20 mA
JUMPER - J10	
IF INPUT SIGNAL IS LOST:	
1-2	= DRIVE TOWARD 4 mA
3-4	= DO NOT MOVE
5-6	= DRIVE TOWARD 20 mA
LED LIGHTS	
D4	= DRIVE TOWARD 4 mA
D5	= DRIVE TOWARD 20 mA
D3	= LOSS OF INPUT SIGNAL
FUSE = 3.15A 250V SLO-BLO 5x20MM	

If the SMP was ordered with the wrong rotation direction: wires on the PC board need to be unsoldered/resoldered and the SMP needs to be re-calibrated (see 'Changing 4mA Rotation' below).

Setup

Before powering the SMP-xx, verify the 4mA rotation direction, and then set the jumpers to the desired operating modes.

Verify the 4mA Rotation Direction:

Before applying 120 Vac power: Disconnect the lever arm and linkage to prevent injury, or damage, when the servo moves.

Disconnect the Input 4-20+ field wire.

Set J10 to the 3-4 position ('Stop When Input Signal is Lost' mode).

Apply 120Vac to the positioner. Servo should not move until J10 is moved.

Move J10 to the 1-2 position (servo will move in the "4mA direction").

Verify that the servo output shaft moves in the direction indicated on the Positioner label.

If desired, Move J10 to 5-6 position to move the servo in the "20mA direction".

To Stop the servo mid-stroke: Disconnect 120Vac power or Set J10 to the 3-4 position.

Note: Servo will move when J10 jumper is not connected to any J10 pins

Disconnect 120Vac and then re-connect the Input 4-20+ field wire.

If the 4mA Rotation Direction is incorrect, see "Changing 4mA Rotation Direction" below.

J9 Input Signal Type:

4-20mA: Jumper 1-2 (250 ohm input resistor)

1-5Vdc: Jumper 2-3 (511k ohm input resistor)

J10 Loss of Input Signal Failure Mode:

This jumper determines what the servo does when the Input signal drops below ~3mA (or 0.75Vdc). LED "D3" turns ON when the Input signal is low (or open).

The servo automatically resumes normal operation when the Input signal increases above ~3mA.

Drive toward 4mA direction: Jumper 1-2

Stop, Do not Move Jumper 3-4

Drive toward 20mA direction: Jumper 5-6

J14 Bad Feedback Pot Wiper Failure Mode:

This jumper determines what the servo does when the Feedback Pot Wiper is open circuit (dirty or bad pot). See the 4mA Rotation Direction Note in the J10 section

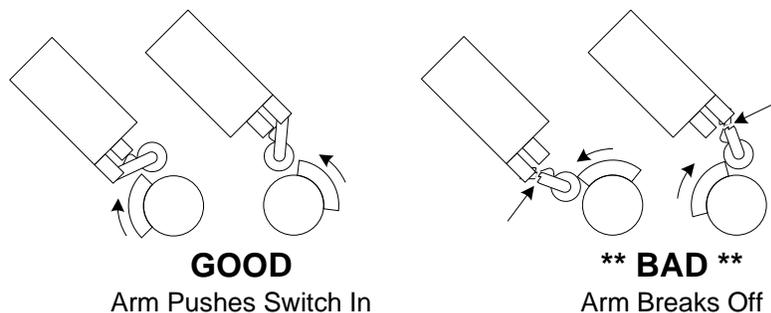
Drive toward 4mA direction: Jumper 1-2

Drive toward 20mA direction: Jumper 2-3

Changing the optional Auxiliary Switches cam positions.

The Aux switches are located external to the servo. The cams can be located in any of 4 quadrants on the shaft by re-locating the hold-down screw for the cam. The cam must actuate the switch with the rotation directions shown below. Improper cam setup will break the switch roller arm.

Use the J10 jumper to position the servo shaft as described above in "Verifying the 4mA Rotation Direction" section.



Adjust the Sensitivity/Deadband Trimpot (R33)

Trimpot R33 adjusts the positioner sensitivity/deadband. If the positioner is too sensitive, the servo can hunt back and forth excessively near the desired position. If the positioner is not sensitive enough, the servo will stop short on either side of the desired position.

Turn R33 CCW to increase sensitivity. Turn R33 CW to decrease sensitivity.

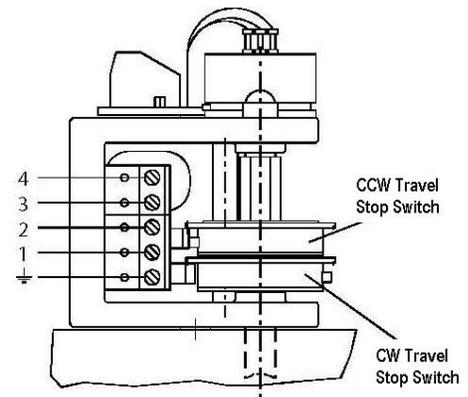
R33 should be adjusted with the servo connected to the valve, damper, etc... because this resistance allows for a tighter sensitivity setting. Test by varying the Input command from above and below the same target signal value. If the servo hunts, decrease the sensitivity. If the servo stops to far away from the desired position, increase the sensitivity.

Setting the Servo Internal Travel Limit Switches

Remove the servo cover and locate the white travel limit cam adjustment wheels as shown in the diagram. One full turn of the wheel moves the cam approximately 30 degrees. See diagram on pg 1 for the definition of CW and CCW directions.

Use the J10 jumper to position the servo shaft as described above in "Verifying the 4mA Rotation Direction" section.

If a significant change is made to either travel limit cam, then typically the 4-20mA feedback signal should be re-calibrated as shown below.



Calibrating the 4-20mA Feedback Output (and 4-20mA/1-5V Input)

Trim pots R43 and R46 calibrate the 4-20mA feedback signal based on the servo shaft position. There are no 4-20mA / 1-5V Input signal adjustments. During operation, the Input signal is compared against the 4-20mA feedback signal. Therefore, the 4-20mA feedback output calibration determines servo positions when the Input signal varies from 4 to 20mA, or 1 to 5Vdc.

This procedure can be used to reduce the stroke to less than 90 degrees or greater than 90 degrees. The desired stroke can not pass through the Forbidden Zone (as defined on pg. 1) because the feedback pot wiper goes open circuit in the center portion of this sector.

Procedure:

- Disconnect the lever arm and linkage to prevent injury, or damage, when the servo moves.
- Disconnect the Input 4-20 "+" field wire.
- Set J10 to the 3-4 position (Stop When Input Signal is Lost).
- Apply 120Vac to the positioner. Servo should not move until J10 is moved.
- Move J10 to 5-6 position to move the servo in the 20mA direction.
- Stop the servo when it is at the desired "20mA" calibration position (typically where the limit switch stops the servo).
- Adjust R46 until the Output 4-20mA measures 20.00mA.
- Move J10 to the 1-2 position (servo will move in the "4mA" direction).
- Stop the servo when it is at the desired "4mA" calibration position (typically where the limit switch stops the servo).
- Adjust R43 until the Output 4-20mA measures 4.00mA.
- Repeat the 4mA and 20mA position adjustments several times until both are correct.
- Reconnect the input wiring, lever arm and linkage.
- Slowly move the servo from the 4mA to the 20 mA positions and watch for any interferences or binding. Insure that the servo is not driving the linkage into a hard stop at either end of travel.

Changing 4mA Rotation Direction

NOTE: Only experienced electronics technicians should attempt to change the rotation in the field.
Wires on the PC board need to be unsoldered/resoldered and the SMP needs to be re-calibrated.

Disconnect the 120Vac power.

Remove the servo cover to expose the positioner board, feedback pot, and motor terminal strip (next to travel limit switches, see diagram above).

Change the 4 wires described below to suit the desired 4mA Rotation Direction:

	4mA = CW	4mA = CCW
Wire Positioner pad J3 to motor terminal:	3	2
Wire Positioner pad J5 to motor terminal:	2	3
Wire Positioner pad J6 to feedback pot terminal:	3	1
Wire Positioner pad J8 to feedback pot terminal:	1	3

The motor has a screw terminal strip and these wires can be changed with a screw driver.

The feedback pot wiring requires unsoldering and resoldering wires.

DO NOT unsolder/resolder wires on the feedback pot pins, excessive heat will damage the pot internals!
Instead, unsolder/resolder the wire ends at the positioner PC board pads J6 & J8.

The 4-20mA Feedback Output MUST be calibrated (described above) after changing the rotation direction.

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