

## 2-WIRE POSITION TRANSMITTER (flameproof, linear motion type)

MODEL **VOS-E**

### BEFORE USE ....

Thank you for choosing M-System. Before use, check the package you received as below.

If you have any problems or questions on the product, please contact M-System's Sales Office or representatives.

#### ■ PACKAGE INCLUDES:

VOS-E unit.....	(1)
Lever .....	(1)
Connecting pin.....	(1)
Nailed nut .....	(1)
Nut .....	(1)
Screws for attaching the lever (M5 x 8) .....	(1)
Plain washer (M5) .....	(1)
Toothed washer (M5, external teeth).....	(1)
Clamp set .....	(1)
(Provided only when ordered as an option)	

Remark: Bracket and other components necessary to attach the VOS-E to actuator are to be provided by the customer.

#### ■ MODEL NO.

Check that the model No. described on the specification label is exactly what you ordered.

### WARNING

#### Explosions could result in death or serious injury:

- The enclosure cover must be completely closed to meet explosion-proof/flameproof requirements.
- Do not open the cover in explosive atmospheres when the circuit is alive.
- Before opening the enclosure, wait at least for 60 seconds after the power is removed.
- Before you connect or disconnect the wiring, turn off the power supply for safety. Do not connect or disconnect unless the area is known to be non-explosive.
- Whenever you need to measure voltage across the terminals, make sure that there is no danger of explosion in the atmosphere.
- Verify the certification of the product described on the specification label on the product.
- Verify that the operating atmosphere of the product is consistent with the appropriate hazardous locations certifications.
- Verify that the environmental temperature is within the temperature class required for the area.

#### Failure to follow these installation guidelines could result in death or serious injury:

- Make sure only qualified personnel perform the installation.

### SAFETY FEATURES & CAUTIONS

Failure to follow the following wiring and installation guidelines could result in death or serious injury:

#### ■ FLAMEPROOF APPROVAL

- Ex d IIB T5
- TIIS TC14314
- Ambient temperature -5 to +40°C

#### ■ WIRING

- Follow wiring practice according to the local code.
- Make sure that diameter of the applicable cable is correct.
- Electrical wiring into the flameproof enclosure is done by cable system. Be sure to use the cable gland attached to the product.
- Be sure to close all unused cable entry conduits with the stopping plug attached to the product.
- Before turning the power supply on, be sure to close the enclosure cover tightly.
- Be sure to earth the unit.
- For external earthing or bonding connection a cable lug shall be used so that the conductor is secured against loosening and twisting and that contact pressure is maintained.

### POINTS OF CAUTION

#### ■ GENERAL

- Cut power supply to the unit before wiring to it, changing the lever position or changing the action direction.
- Torque applied to the screws attaching the cover is 2.5 – 3.5 N·m.

#### ■ ENVIRONMENT

- Inside building. If outside, keep away from direct sunlight.
- Operating temperature -5 to +50°C (23 to 122°F)
- ▲ Limited to -5 to +40°C (23 to 104°F) for use in an explosive atmosphere.
- Do not place the unit in a strong magnetic field.

#### ■ DESIGN OF MOUNTING BRACKET

- The size "x" indicated in Figure 2 must be longer than 10 % of full-stroke of the actuator when it is in the middle position.
- The VOS-E unit must be positioned in parallel or in vertical to the actuator stroke.

#### ■ ACTUATOR SIDE LEVER

- When the actuator side lever is provided by the customer, be sure that width of the hole threading the connecting pin is 5 millimeters or wider.  
Diameter of connecting pin: 5<sup>0</sup><sub>-0.03</sub> mm

# COMPONENT IDENTIFICATION

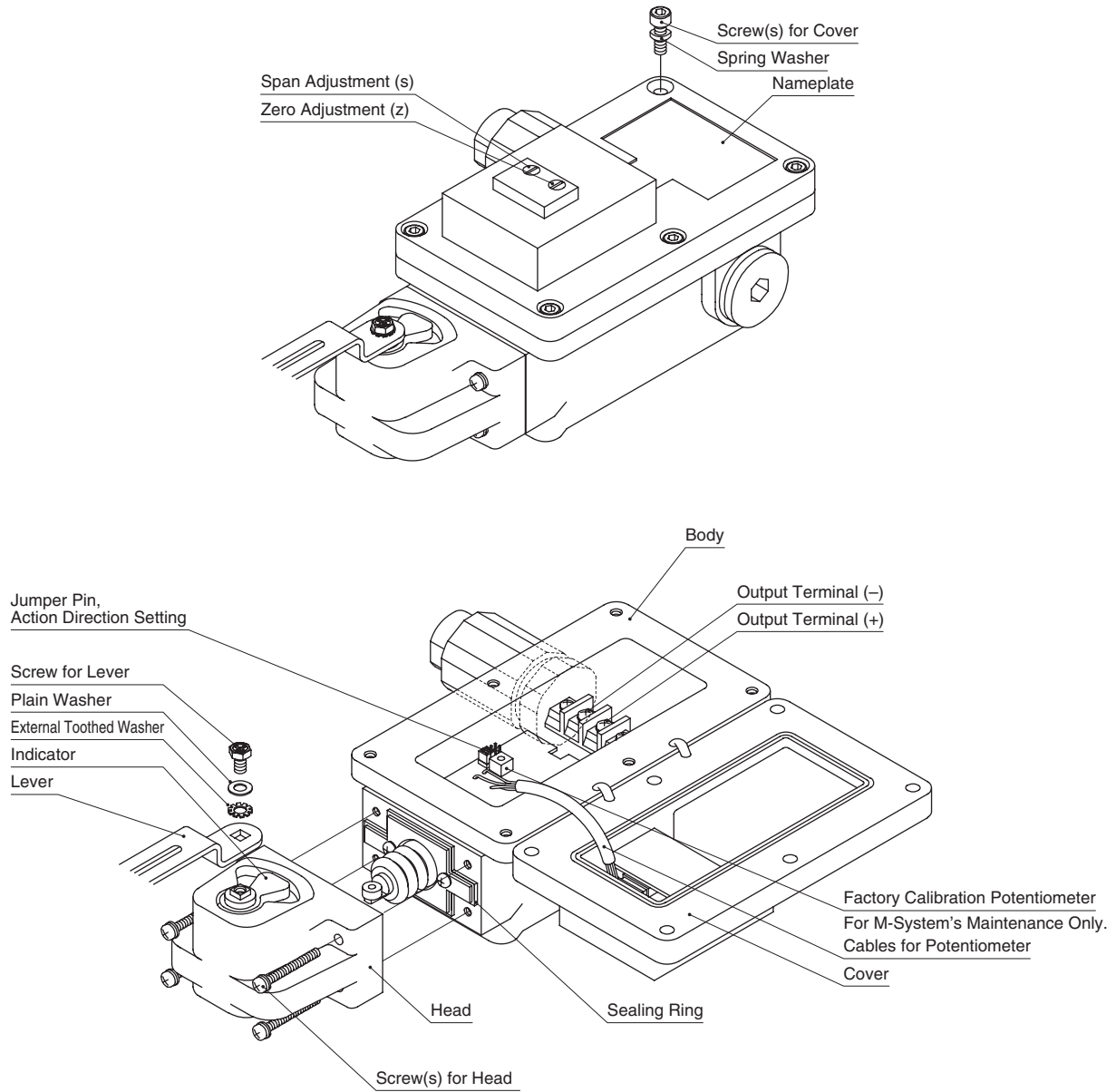


Fig. 1

## INSTALLATION

The output accuracy of the VOS-E is largely affected by its mechanical position relative to the actuator. The VOS-E should be installed according to the following instructions because an improper installation may lower its performance. No unnecessary strain should be applied to the VOS-E unit or the lever.

### ■ ATTACHING THE CONNECTING PIN TO THE VOS-E SIDE LEVER

Attach the connecting pin to the VOS-E side lever utilizing the nailed nut and the nut as in Figure 2. The nail could be positioned in either side of the lever, however it is limited to one side at the extreme end of the lever hole.

Position of the connecting pin is determined by valve stroke. Refer to Figure 3 for its approximate position with various lever length (or stroke). ( $\pm 22.5^\circ$  rotation for the stroke)

Remark: It is recommended to set the connecting pin at this stage to the position a little nearer to the actuator than the calculated position in order to prevent over-range rotation of the VOS-E side lever. Move it back to the correct position later in the adjustment procedure.

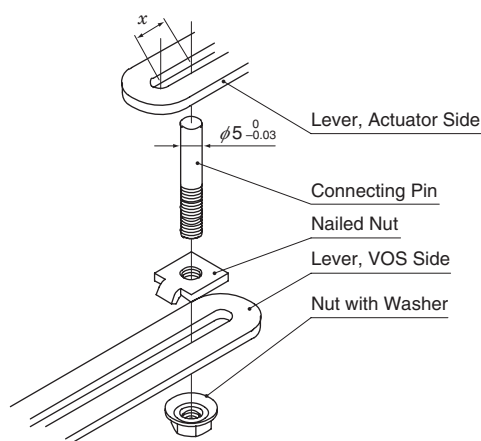
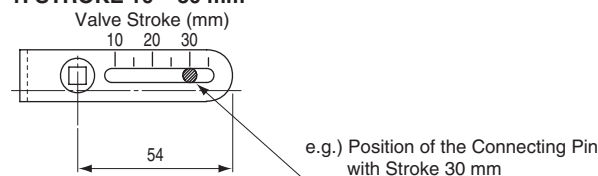
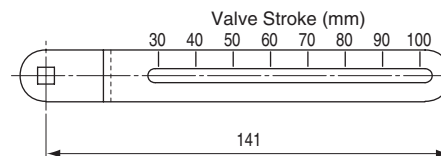


Fig. 2

### 1: STROKE 10 – 30 mm



### 2: STROKE 30 – 100 mm



### 3: STROKE 25 – 60 mm

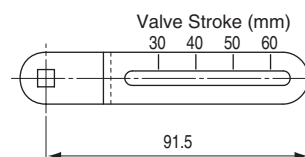


Fig. 3

### ■ CONNECTING THE VOS-E SIDE LEVER TO THE VOS-E UNIT

Connect the lever to the VOS-E unit with a screw included in the package, with a plain washer and a toothed washer between them as in Figure 1.

Lever direction can be changed by 90 degrees.

### ■ CONNECTING THE VOS-E UNIT TO THE ACTUATOR

Set the VOS-E unit to the position where the VOS-E output is approximately 12 mA with 50% actuator position, and where the VOS-E side lever and the actuator side lever are positioned in a straight line. See Figure 4 below. The actuator side lever should be threaded with the connecting pin but left loose. Do not fix the connecting pin to the actuator side lever.

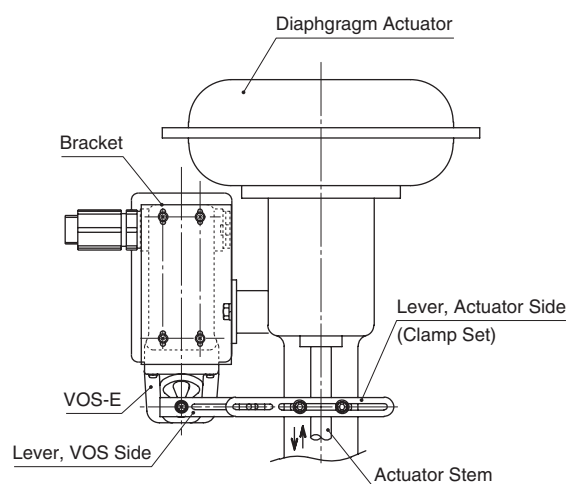


Fig. 4

## ELECTRICAL WIRING

Keep away from water during wiring work.

Refer to Figure 1 and Figure 5 – 1 and proceed as following:

- 1) Loosen the hexagon socket set screws on the cover (6 positions) and open the cover.
- 2) Loosen the nut of the wiring conduit and remove the nut and ring.
- 3) Remove the gland of the conduit with a monkey wrench, together with the clamp panel of the ground.
- 4) Remove the packing and slip ring found inside the nipple.
- 5) Thread a cable through the above parts – nut – ring – ground – slip ring – packing – and nipple and lead it into the terminal board inside the VOS-E body.
- 6) Connect the wire referring to Figure 5 – 2.
- 7) Close the cover and fasten the screws with spring washers.  
Do not put the potentiometer cable between the cover and the body.

- 8) Put the packing and the slip ring into the nipple and tighten the ground. Pull the cable lightly and check that it is set firmly. Fasten the ground one more turn. Adjust the angle of the ground within  $\pm 120$  degrees from the last position if it is inconvenient to attach the clamp panel.
- 9) Fasten the nipple with the attached hexagon socket set screws attached and secure it so that the ground does not work loose.
- 10) Attach the clamp panel with the cross recessed panhead screw provided with it.
- 11) Fasten the nut lightly in leaving the ring to turn loose.
- 12) Connect a protective pipe to the ring.
- 13) Fasten the nut tightly until the ring is secured.

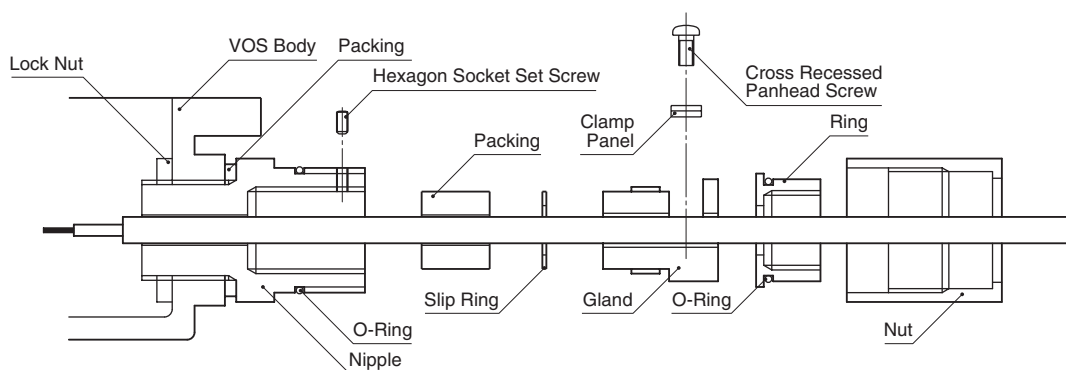


Fig. 5-1

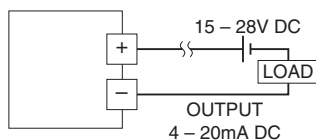


Fig. 5-2

## ADJUSTMENT PROCEDURE

Zero (Z) and Span (S) adjustment procedure is explained as below. Other adjustments which are locked with paint are only for factory use. **DO NOT CHANGE THESE SETTINGS. IF YOU HAVE DONE SO WITHOUT M-SYSTEM'S AUTHORIZATION, M-SYSTEM WILL NOT BE LIABLE FOR ANY INCONVENIENCE CAUSED BY THAT.**

### ■ HOW TO ADJUST ZERO AND SPAN

1) First operate the actuator slowly for full-stroke and check that the VOS-E outputs approximately 0 – 100% (4 – 20mA DC) accordingly. Be sure also that the output signal increases or decreases without interruption.

Remark: If the VOS-E indicator (red) is stopped or nearly stopped at the end of its housing within the full-stroke, stop the input signal, loosen the connecting pin and move it a little toward the actuator stem side. Then tighten it again.

2) With 50% input (actuator position), check that the output is approximately 50%. See Figure 6.

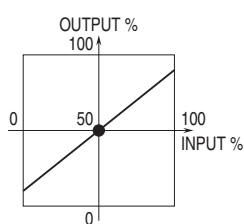


Fig. 6

3) With 0% input, adjust the output to 0% with Zero adjustment. See Figure 7.

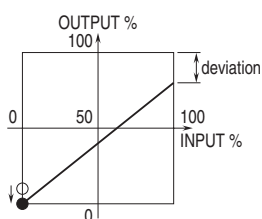


Fig. 7

4) Set the input to 100%. If there is a deviation in output signal, compensate half of the deviation via the Zero adjustment. See Figure 8.

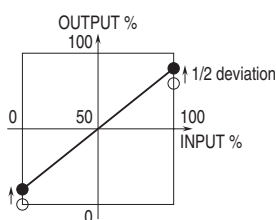


Fig. 8

5) With 100% input, adjust the other half of the deviation with Span adjustment in order to get 100% output. See Figure 9.

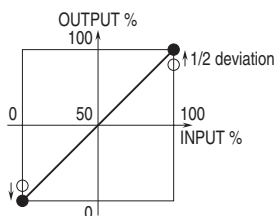


Fig. 9

6) Input 0%, 50% and 100% signals and check the output according to the respective input value. If the output value is shifted, repeat the above procedure (2) – (5).

## LEVER POSITION & ACTION DIRECTION

⚠ Cut power supply to the unit before proceeding. Check that there is no explosive atmosphere.

Proceed as explained in the following when changing the lever position (upper or lower) and action direction (direct or reverse).

### ■ HOW TO CHANGE LEVER POSITION

- 1) Loosen 4 screws in Figure 1 which fix the head part and detach it.
- 2) Turn the head part by 180 degrees (upside down) and reattach it with the above screws. Be sure to return the gasket (sealing ring) to the proper position.

### ■ HOW TO CHANGE ACTION DIRECTION

Loosen screws fixing the unit cover, remove it and change the jumper pin positions behind it. See Table 1 below.

Table 1

		Upper Lever Position		Lower Lever Position	
		Direct Action	Reverse Action	Direct Action	Reverse Action
Input/Output Relation		OUT INCR.    OUT DECR.	OUT DECR.    OUT INCR.	OUT INCR.    OUT DECR.	OUT DECR.    OUT INCR.
Jumper Pin Position					

Remark: indicates that the jumpers are installed.

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## MAINTENANCE

### ■ MECHANICAL PARTS

- Check that screws are fastened tightly and if some of them are loosened, be sure to re-tighten them.  
If you find the connecting pin loose, go through ADJUSTMENT PROCEDURE again.
- Inspect visually that the connecting section of levers is stable and smooth. Check also that the connecting pin or lever is not worn. If it is, it must be replaced. Consult M-System or local representative. If the abrasion advances fairly quickly, there may be a problem in the position of the connecting pin.
- If the VOS-E is installed outside the building or where it is subject to water or metallic dust particles, check that there is no crack or bruise on its gasket (sealing ring). If you find any, consult M-System or local representative.
- Consult M-System or local representative also for inspection of packing (O-ring) in the moving parts.

### ■ ELECTRICAL PARTS

- Check first the mechanical parts as above.
- Change actuator positions and input 0%, 20%, 40%, 60%, 80% and 100% signals. Check the output with respective input value is within allowance indicated in the specifications. If not, go through ADJUSTMENT PROCEDURE again.

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## LIGHTNING PROTECTION

In order to protect the instruments from surges induced by lightning, use of dedicated lightning arresters is recommended. The M-RESTER lightning surge protectors are available in M-System's product catalog.