

# Analog Displacement Sensors for Transportation Applications



## FEATURES

- Conductive plastic potentiometer technology
- Use in engine compartment
- Lever drive with return spring
- Wire outputs
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

## LINKS TO ADDITIONAL RESOURCES



3D Models

## QUICK REFERENCE DATA

|                  |                                                                |
|------------------|----------------------------------------------------------------|
| Sensor type      | ROTATIONAL, conductive plastic                                 |
| Output type      | Output by wires                                                |
| Market appliance | Transportation                                                 |
| Dimensions       | 39.2 mm (or 42 mm, or 47 mm) x 31.5 mm (or 34.2 mm) x 23.37 mm |

## ELECTRICAL SPECIFICATIONS

| PARAMETER                                   |                                |
|---------------------------------------------|--------------------------------|
| Total electrical travel                     | $94^{\circ} \pm 2^{\circ}$     |
| Independent linearity standard              | $\pm 1.5\%$                    |
| Total resistance ( $R_n$ )                  | $3.85\text{ k}\Omega \pm 20\%$ |
| Output smoothness                           | $< 0.1\%$ (NFC 93255)          |
| Power rating at $+40^{\circ}\text{C}$       | 0.5 W                          |
| Power rating at $+125^{\circ}\text{C}$      | 0.05 W                         |
| Wiper current limiting resistance ( $R_p$ ) | $1.7\text{ k}\Omega \pm 20\%$  |
| Recommended wiper current                   | $< 100\text{ }\mu\text{A}$     |
| Maximum wiper current                       | 15 mA for 1 min                |
| Recommended load impedance                  | $\geq 100 R_n$                 |

## MECHANICAL SPECIFICATIONS

| PARAMETER                              |                                      |
|----------------------------------------|--------------------------------------|
| Mechanical travel                      | $125^{\circ} \pm 4^{\circ}$          |
| Lever return torque at start of travel | $\geq 1\text{ N cm}$                 |
| Lever return torque at end of travel   | $\leq 10\text{ N cm}$                |
| Stop strength                          | 60 N cm                              |
| Lever return                           | Counterclockwise                     |
| Protection class                       | See "Specific Characteristics" table |
| Mounting screw tightening torque       | 1.2 N m maximum                      |

## PERFORMANCE

| PARAMETER                       |                                                 |
|---------------------------------|-------------------------------------------------|
| Operating temperature range     | $-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ |
| Storage temperature range       | $-55^{\circ}\text{C}$ to $+135^{\circ}\text{C}$ |
| Vibrations                      | Severity 10 Hz to 2000 Hz, 10 mm or 50 g        |
| Life                            | See "Specific Characteristics" table            |
| Micro-movements (dither stroke) | $> 50\text{M}$ cycles                           |

**SAP PART NUMBERING GUIDELINES**

| MODEL | TYPE                             | LEVER TYPE                 | VALUE     | ANGLE | LEADS    | PACKAGING                                |
|-------|----------------------------------|----------------------------|-----------|-------|----------|------------------------------------------|
| PMR4  | 03                               | A = lever A<br>C = lever C | 392 = 3K9 | 094   | W = wire | C = 20 pcs<br>G = 100 pcs<br>P = 500 pcs |
|       | 23                               |                            |           |       |          |                                          |
|       | 02                               |                            |           |       |          |                                          |
|       | 22                               |                            |           |       |          |                                          |
|       | 04                               |                            |           |       |          |                                          |
|       | 24                               |                            |           |       |          |                                          |
|       | 01                               |                            |           |       |          |                                          |
|       | 21                               |                            |           |       |          |                                          |
|       | 11                               |                            |           |       |          |                                          |
|       | 31                               |                            |           |       |          |                                          |
|       | 12                               |                            |           |       |          |                                          |
|       | 16                               |                            |           |       |          |                                          |
|       | 26                               |                            |           |       |          |                                          |
|       | 18                               |                            |           |       |          |                                          |
|       | 28                               |                            |           |       |          |                                          |
|       | (see "Specific Characteristics") |                            |           |       |          |                                          |

**SPECIFIC CHARACTERISTICS**

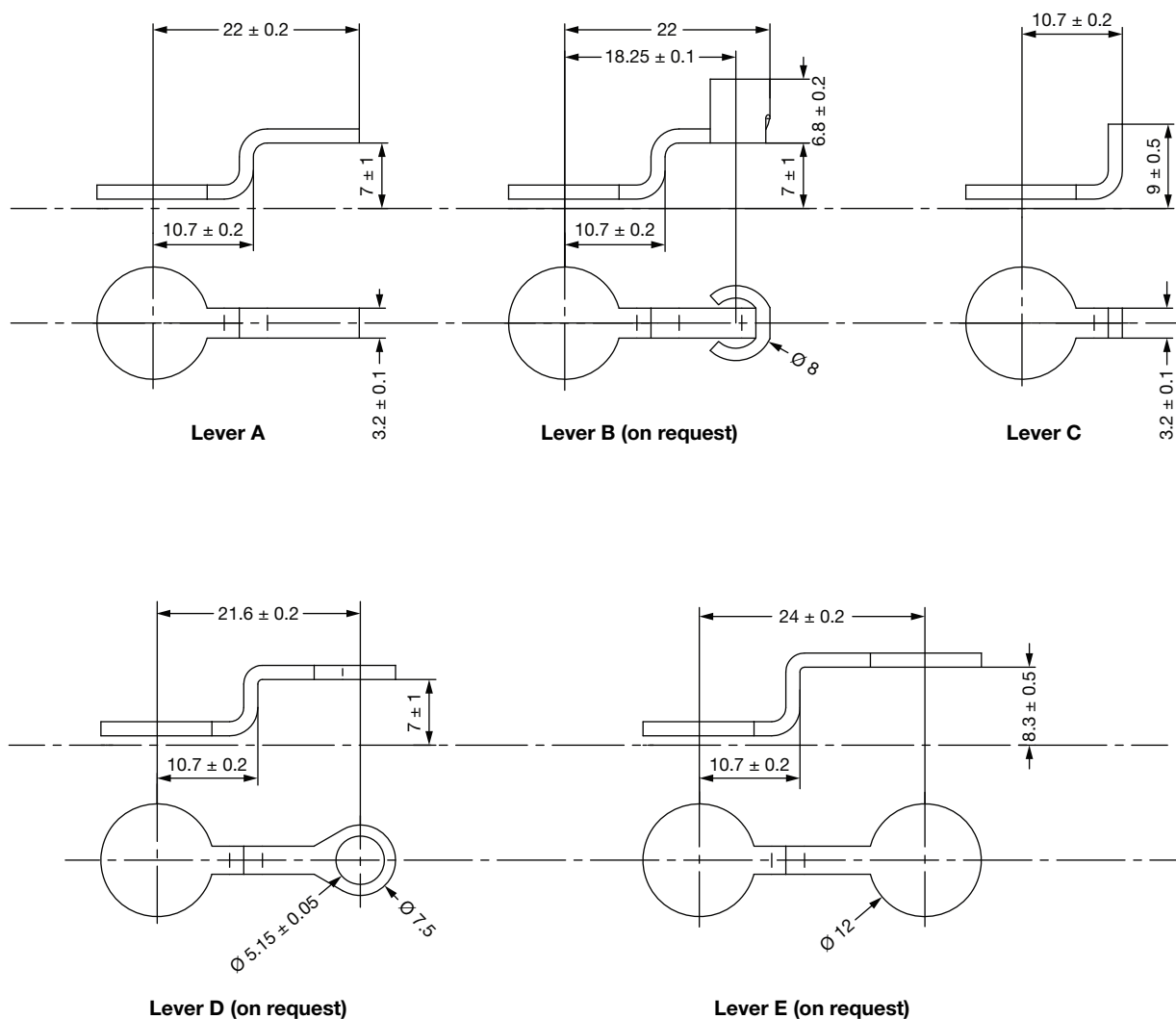
| SENSOR TYPE | LIFE                               |                                       | PROTECTION CLASS | PACKAGE TYPE <sup>(1)</sup> |
|-------------|------------------------------------|---------------------------------------|------------------|-----------------------------|
|             | MICRO-MOVEMENTS<br>(dither stroke) | NUMBER OF CYCLES<br>ELECTRICAL TRAVEL |                  |                             |
| 403         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP64             | 1                           |
| 423         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP64             | 2                           |
| 402         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP64             | 3                           |
| 422         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP64             | 4                           |
| 404         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 1                           |
| 424         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 2                           |
| 401         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 3                           |
| 421         | 10 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 4                           |
| 411         | 50 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP64             | 1                           |
| 431         | 50 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP64             | 2                           |
| 412         | 50 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP64             | 3                           |
| 416         | 50 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 1                           |
| 426         | 50 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 2                           |
| 418         | 50 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 3                           |
| 428         | 50 x 10 <sup>6</sup>               | 5 x 10 <sup>6</sup>                   | IP66             | 4                           |

**Notes**

- Nothing stated herein shall be construed as a guarantee of quality or durability.

<sup>(1)</sup> Package types

- |                          |                                       |
|--------------------------|---------------------------------------|
| 1: Little ears           | Fixation: 2 screws M4 with Ø: 31.5 mm |
| 2: Little tightened ears | Fixation: 2 screws M4 with Ø: 31.5 mm |
| 3: Big ears              | Fixation: 2 screws M4 with Ø: 34 mm   |
| 4: Big tightened ears    | Fixation: 2 screws M4 with Ø: 34 mm   |

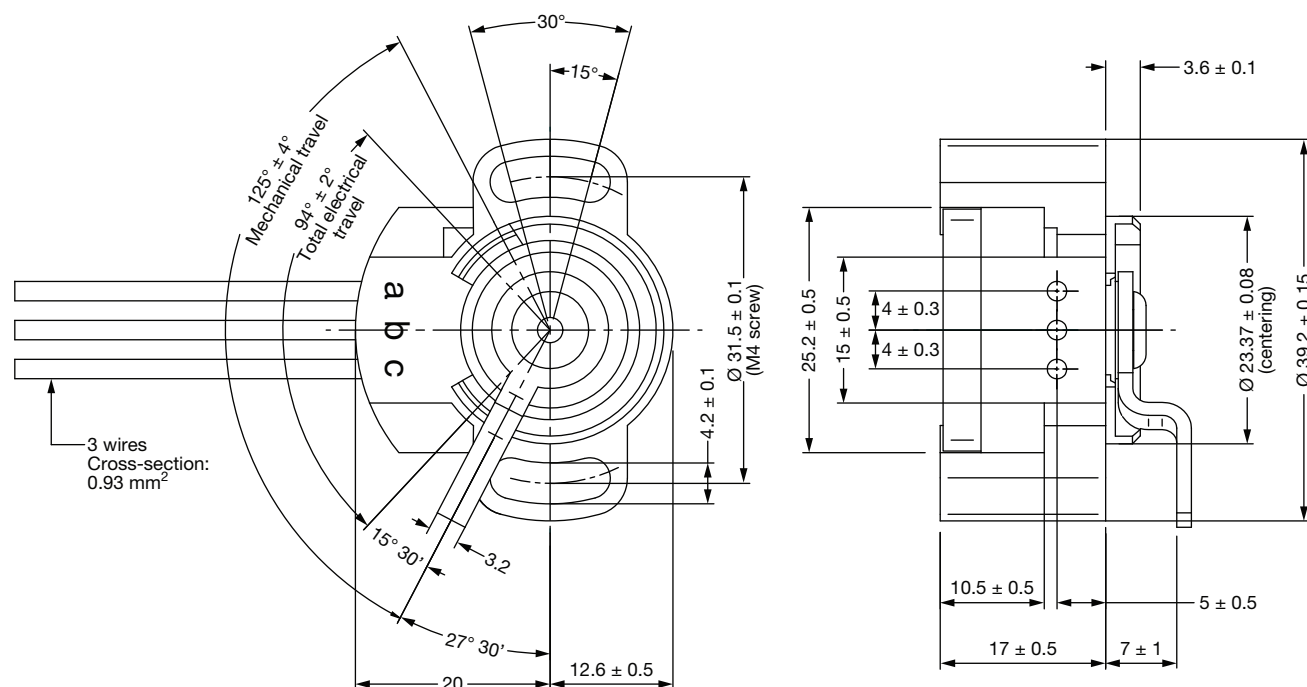
**LEVER OPTIONS**

**CONNECTIONS**

**Wire Outputs:** -40 °C to +105 °C (3 x 0.93 mm<sup>2</sup> length 300 mm)

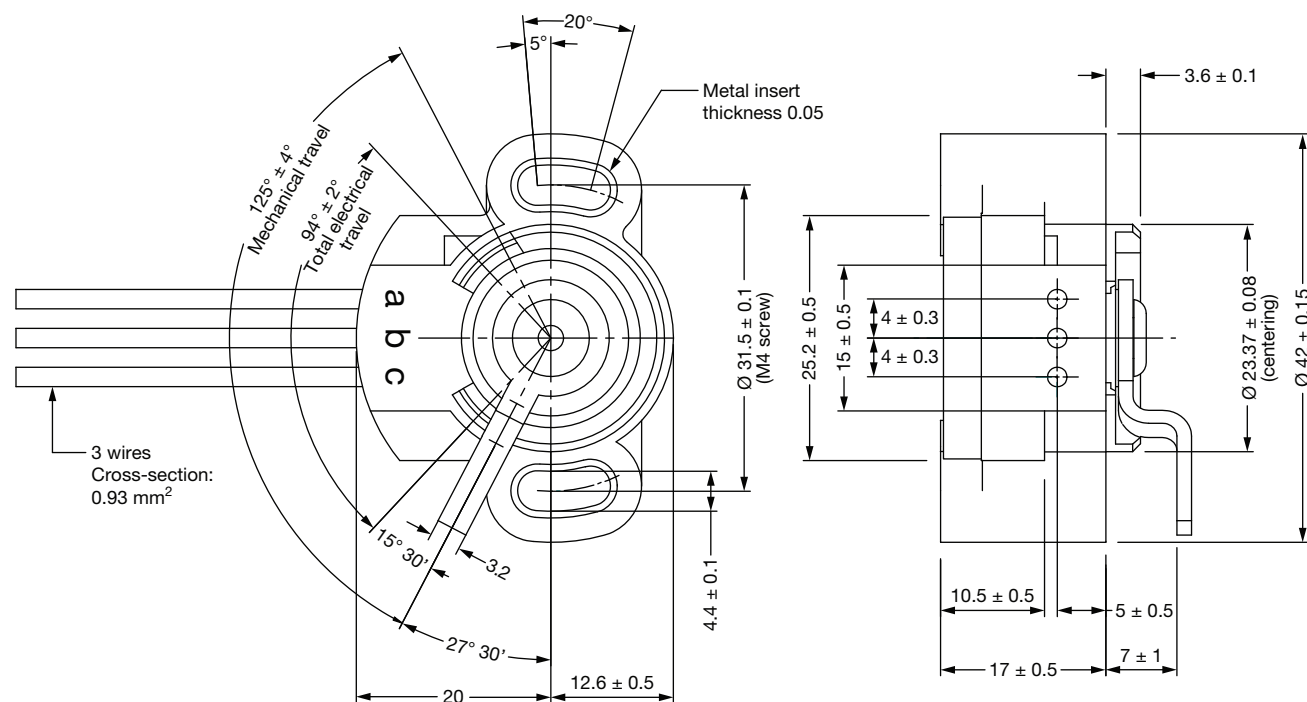
**Sheathed Wire Outputs:** -40 °C to +125 °C optional

**DIMENSIONS** in millimeters

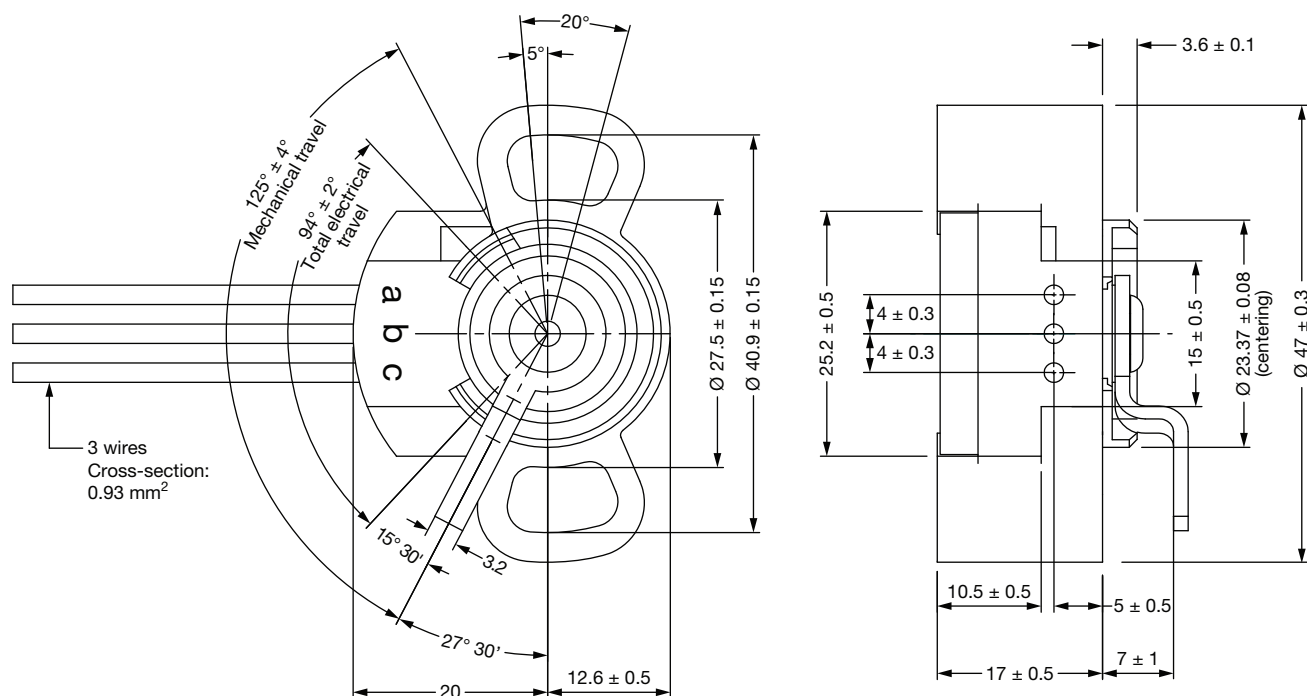
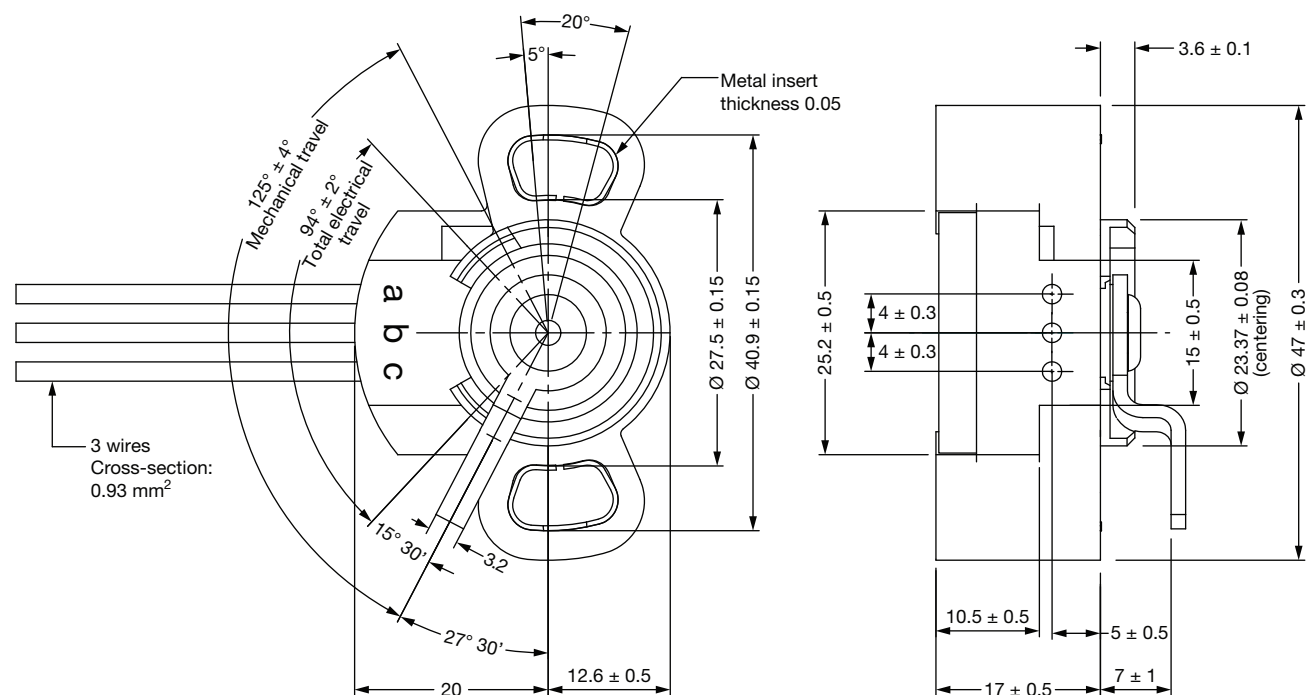
### PACKAGE TYPE 1 (FOR SENSOR TYPES 403, 404, 411, AND 416)

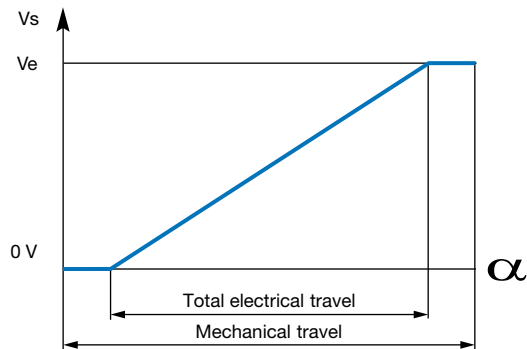
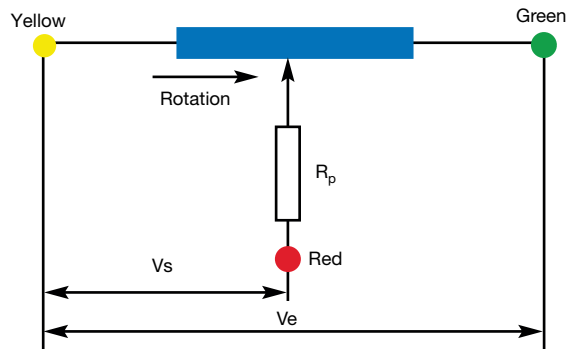


### PACKAGE TYPE 2 (FOR SENSOR TYPES 423, 424, 426, AND 431)



**DIMENSIONS** in millimeters

**PACKAGE TYPE 3 (FOR SENSOR TYPES 401, 402, 412, AND 418)**

**PACKAGE TYPE 4 (FOR SENSOR TYPES 421, 422, AND 428)**


**ELECTRICAL DIAGRAM**

**OPTIONS** (on request)

- Other total electrical travel
- Other resistance values
- Other linearity
- No protection resistance ( $R_p$ )
- High temperature sheathed wire outputs
- Specific connections
- Clockwise spring lever direction
- Other lever



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