

## Precision Rotative Transducers, Conductive Plastic, Economic Series (ECO)



The “ECO” models are a comprehensive range of rotational motion transducers for industrial applications.

All mechanical and electrical parameters can be adapted to meet your specifications.

### FEATURES

- Size 05 - 09 - 13 are available
- Long life up to 30 million cycles
- Accuracy  $\pm 1\%$  down to  $\pm 0.25\%$
- Bush or servo mounting types
- Rear mounted terminals
- Following MIL-R-39023 and NFC 93-255 requirements
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### QUICK REFERENCE DATA

|                  |                                |
|------------------|--------------------------------|
| Sensor type      | ROTATIONAL, conductive plastic |
| Output type      | Output by turrets              |
| Market appliance | Industrial                     |
| Dimensions       | Various sizes                  |

| SIZE  | 05    |       | 09    |       |       | 13     |        |        |
|-------|-------|-------|-------|-------|-------|--------|--------|--------|
| MODEL | 50 ES | 50 CB | 78 ES | 78 CS | 78 CB | 156 ES | 156 CS | 156 CB |

### ELECTRICAL SPECIFICATIONS

|                                     |                                                |         |                          |         |                           |         |
|-------------------------------------|------------------------------------------------|---------|--------------------------|---------|---------------------------|---------|
| Theoretical electrical travel (TET) | Actual electrical angle (AEA) - 2°             |         |                          |         |                           |         |
| Independent linearity (over TET)    | A ≤ ± 1 %<br>(standard)                        |         | B ≤ ± 0.5 %<br>(special) |         | C ≤ ± 0.25 %<br>(special) |         |
| Actual electrical travel (AET)      | 330° ± 5°                                      |         | 340° ± 5°                |         | 350° ± 5°                 |         |
| Ohmic values (R <sub>T</sub> )      | 1 kΩ - 5 kΩ - 10 kΩ - on request other values  |         |                          |         |                           |         |
| Ohmic value tolerances at 20 °C     | ± 10 %                                         | ± 20 %  | ± 10 %                   | ± 20 %  | ± 10 %                    | ± 20 %  |
| Output smoothness                   | ≤ 0.05 %                                       |         |                          |         |                           |         |
| Maximum power rating at 70 °C       | 0.2 W                                          |         | 0.3 W                    |         | 0.5 W                     |         |
| Wiper current                       | Recommended: a few μA - 1 mA max. (continuous) |         |                          |         |                           |         |
| Tap (current or voltage)            | NA                                             |         | 1 (on request)           |         |                           |         |
| Resistance load on wiper            | Minimum 10 <sup>3</sup> x R <sub>T</sub>       |         |                          |         |                           |         |
| End voltage                         | ≤ 0.2 %                                        | ≤ 0.5 % | ≤ 0.2 %                  | ≤ 0.5 % | ≤ 0.2 %                   | ≤ 0.5 % |
| Insulation resistance               | ≥ 1000 MΩ, 500 V <sub>DC</sub>                 |         |                          |         |                           |         |
| Dielectric strength                 | ≥ 500 V <sub>RMS</sub> , 50 Hz                 |         |                          |         |                           |         |

### MECHANICAL SPECIFICATIONS

|                                        |                                     |                 |                         |                 |                         |                 |
|----------------------------------------|-------------------------------------|-----------------|-------------------------|-----------------|-------------------------|-----------------|
| Mechanical angle (MA)                  | 360° continuous                     |                 |                         |                 |                         |                 |
| On request: stops                      | NA                                  |                 | $340^\circ \pm 3^\circ$ |                 | $350^\circ \pm 3^\circ$ |                 |
| Mounting type                          | Servo                               | Bushing         | Servo                   | Bushing         | Servo                   | Bushing         |
| Shaft guiding                          | Ball bearings                       | Sleeve bearings | Ball bearings           | Sleeve bearings | Ball bearings           | Sleeve bearings |
| Shaft                                  | Stainless steel                     |                 |                         |                 |                         |                 |
| Housing                                | Plastic molding                     |                 |                         |                 |                         |                 |
| Termination                            | Turrets                             |                 |                         |                 |                         |                 |
| Wiper                                  | Precious metal multi-finger contact |                 |                         |                 |                         |                 |
| Starting torque (N.cm) in TET          | $\leq 0.2$                          | $\leq 0.5$      | $\leq 0.2$              | $\leq 0.5$      | $\leq 0.2$              | $\leq 0.5$      |
| Torque on stops (N.cm)                 | 50                                  |                 |                         |                 |                         |                 |
| Weight (g)                             | $5 \pm 2$                           | $8 \pm 2$       | $13 \pm 2$              | $17 \pm 2$      | $29 \pm 2$              | $34 \pm 2$      |
| Moment of inertia (g cm <sup>2</sup> ) | $\leq 0.5$                          |                 | $\leq 1$                |                 | $\leq 2$                |                 |

**PERFORMANCE**

| MODELS                        | ES                                   | CS and CB |
|-------------------------------|--------------------------------------|-----------|
| Life (10 <sup>6</sup> cycles) | 30                                   | 20        |
| Temperature range             | -55 °C to +125 °C                    |           |
| Climatic category             | 55/125/04                            |           |
| Speed rotation (RPM)          | 600                                  | 150       |
| Sine vibration on 3 axes      | 1.5 mm or 20 g from 10 Hz to 2000 Hz |           |
| Mechanical shocks on 3 axes   | 50 g - 11 ms - half sine             |           |

**Note**

- Nothing stated herein shall be construed as a guarantee of quality or durability
- Life under Vishay laboratory conditions

**DIMENSIONS** in millimeters, general tolerance  $\pm 0.5$  mm

**SIZE 05/09/13**
**SERVO MOUNT TYPE**

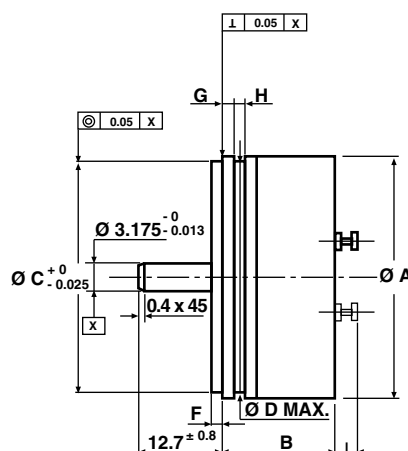
50 ES

78 ES

78 CS

156 ES

156 CS



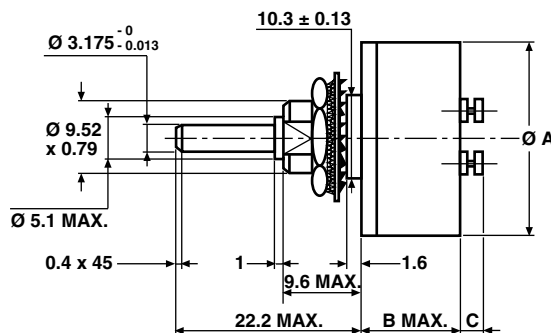
| DIMENSIONS | DESIGNATION          | SIZE 05   | SIZE 09   |       | SIZE 13 |        |
|------------|----------------------|-----------|-----------|-------|---------|--------|
|            |                      | 50 ES     | 78 ES     | 78 CS | 156 ES  | 156 CS |
| Ø A        | Ø housing            | 12.7      | 22.2      |       | 33.3    |        |
| B          | Length               | 13.0      | 13.5      |       | 18.0    |        |
| Ø C        | Ø pilot              | 9.525     | 19.05     |       | 30.16   |        |
| Ø D max.   | Ø groove             | 11.45     | 19.64     |       | 30.9    |        |
| F          | Flange thickness     | 1 ± 0.1   | 1.6 ± 0.1 |       |         |        |
| G          | Shoulder             | 1.2 ± 0.1 | 1.6 ± 0.1 |       |         |        |
| H          | Dia. of groove       | 1.2 ± 0.2 | 1.5 min.  |       |         |        |
| I max.     | Height of the turret | 2.5       | 2.5       |       | 3.6     |        |

**SIZE 05/09/13**
**BUSHING MOUNT TYPE**

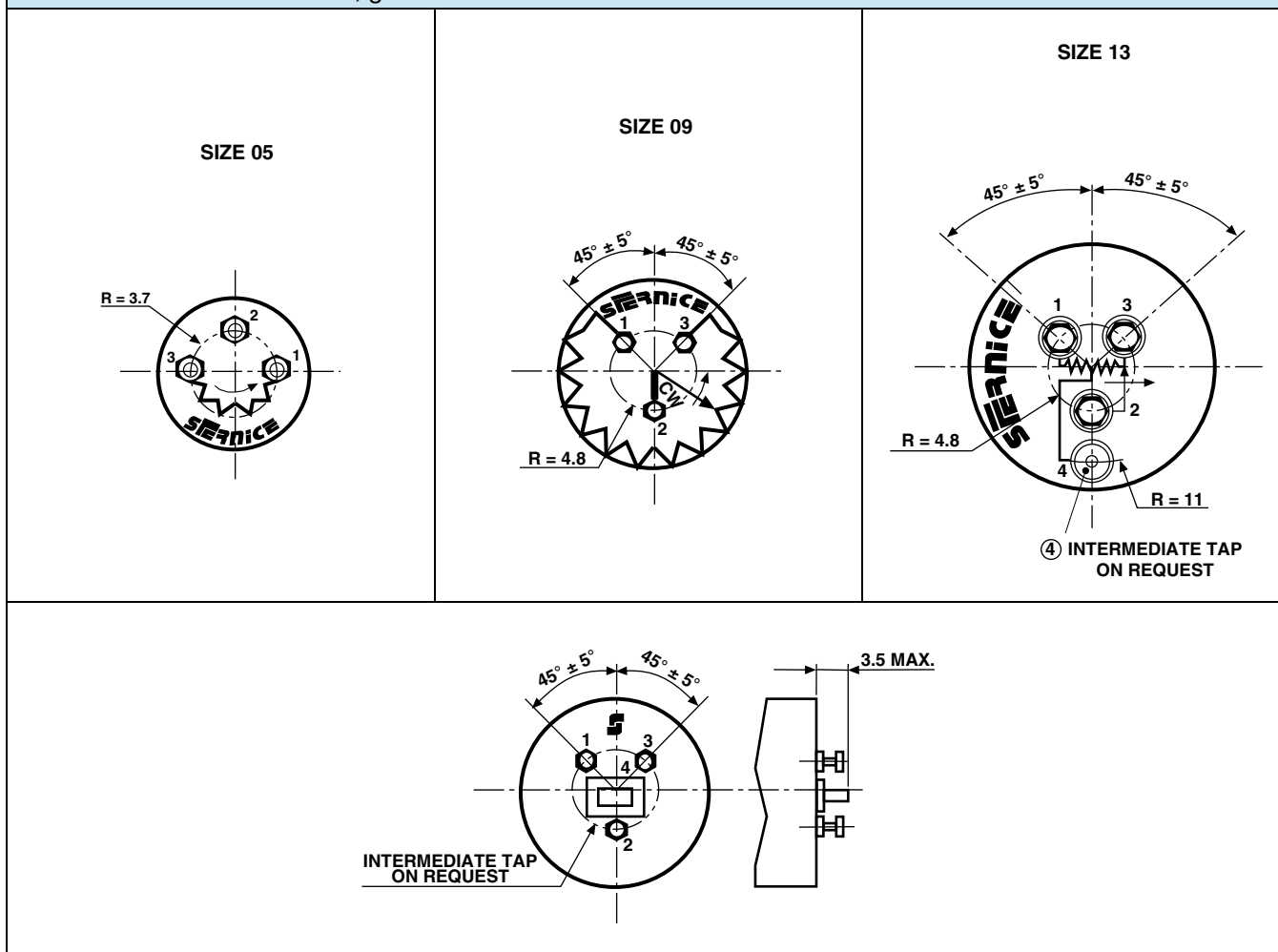
50 CB

78 CB

156 CB



| DIMENSIONS | DESIGNATION          | SIZE 05 | SIZE 09 |  | SIZE 13 |  |
|------------|----------------------|---------|---------|--|---------|--|
|            |                      | 50 CB   | 78 CB   |  | 156 CB  |  |
| Ø A        | Ø housing            | 12.7    | 22.2    |  | 33.3    |  |
| B max.     | Length               | 11      | 11.5    |  | 16      |  |
| C max.     | Height of the turret | 2.5     | 2.5     |  | 3.6     |  |

**DIMENSIONS** in millimeters, general tolerance  $\pm 0.5$  mm

**ORDERING INFORMATION/DESCRIPTION**

| ECO    | 78    | E                                        | S                      | A                                                 | T                                                                  | 103                                                                                       | e4          |
|--------|-------|------------------------------------------|------------------------|---------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------|
| SERIES | MODEL | TYPE                                     | FIXATION               | LINEARITY CODE                                    | TAP                                                                | OHMIC VALUE                                                                               | LEAD FINISH |
|        |       | E = Ball bearings<br>C = Sleeve bearings | S: Servo<br>B: Bushing | A: $\pm 1$ %<br>B: $\pm 0.5$ %<br>C: $\pm 0.25$ % | On request<br>T: Voltage<br>U: Current<br>position to be specified | First 2 digits are significant<br>numbers 3 <sup>rd</sup> digit indicates number of zeros |             |

Special characteristics and designs on request

**SAP PART NUMBERING GUIDELINES**

| ECO    | 78CB  | C         | 502         |
|--------|-------|-----------|-------------|
| SERIES | MODEL | LINEARITY | OHMIC VALUE |



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