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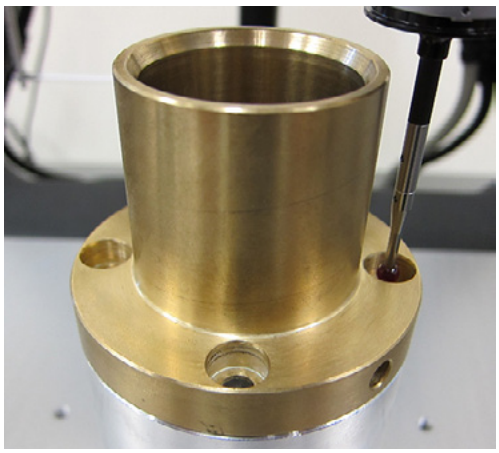
# Gauge R&R study – brass sleeve

## Industry: Drives



## Type 1 Gauge R&R

Type 1 tests are simple repeatability trials with one operator, one part and multiple repetitions. Results show gauge repeatability.

### Test conditions, type 1

| | |
|---|---|
| Gauging cycle time: | 47 sec |
| Number of repetitions: | 32 |

### Test results, type 1

| | Feature measured | Cg | Cgk | % of tolerance |
|---|---|---|---|---|
| ∅ | C'bore | 27.11 | 27.02 | 0.74 |
| ⊥ | C'bore perp | 4.52 | 4.51 | 4.43 |
| ∅ | 40mm bore | 27.11 | 27.02 | 0.74 |
| ⟷ | Flange-top dist. | 27.11 | 27.02 | 0.74 |

## Type 2 Gauge R&R

Type 2 tests involve multiple operators, multiple parts and multiple repetitions. Results give an indication of real world conditions, including factors such as gauge repeatability, fixture distortion and operator inconsistencies.

### Test conditions, type 2

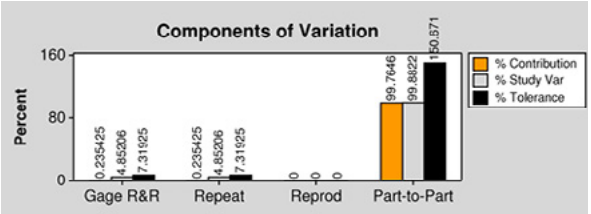
| | |
|---|---|
| Gauging cycle time: | 47 sec |
| Number of components: | 3 |
| Mastering frequency: | 3 |
| Number of operators: | 4 |
| Number of repetitions: | 7 |
| Total gauging operations: | 84 |

### Test results, type 2

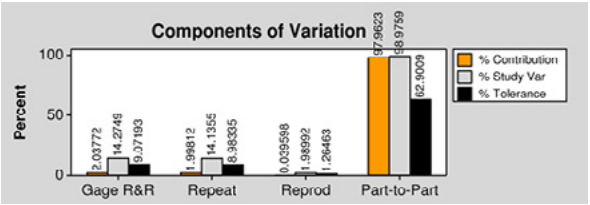
| | Feature measured | Tolerance | % of tolerance* |
|---|---|---|---|
| ∅ | C'bore | 0.04 | 7.32 |
| ⊥ | C'bore perp. | 0.04 | 9.07 |
| ∅ | 40mm bore | 0.05 | 8.73 |
| ⟷ | Flange-top dist. | 0.04 | 9.00 |

*R&R of measuring process (using Equator) as % of tolerance

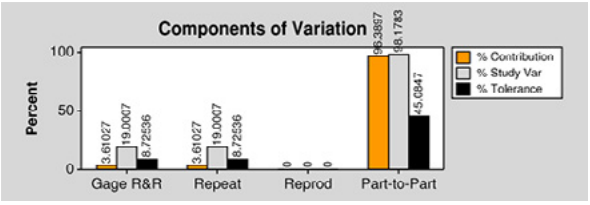
### ∅ C'bore



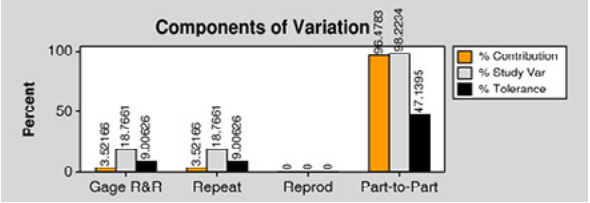

### ⊥ C'bore 9 o' clock perpendicularity




### ∅ 40 bore




### ⟷ Distance between flange face and top plane



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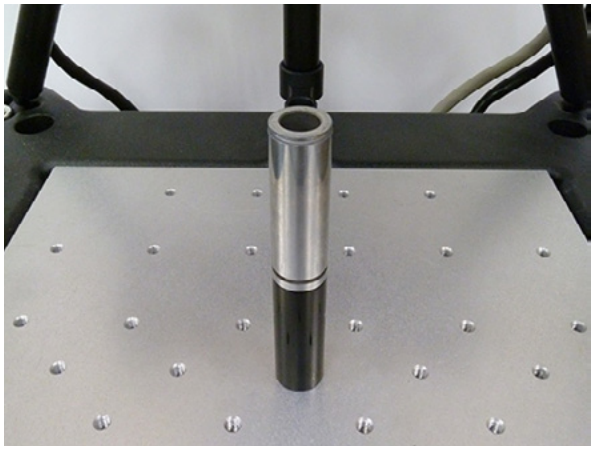
# Gauge R&R study – linear bearing

## Industry: Drives



## Type 1 Gauge R&R

Type 1 tests are simple repeatability trials with one operator, one part and multiple repetitions. Results show gauge repeatability.

### Test conditions, type 1

| | |
|---|---|
| Gauging cycle time: | 58 sec |
| Number of repetitions: | 32 |

### Test results, type 1

| | Feature measured | Cg | Cgk | % of tolerance |
|---|---|---|---|---|
| ⌭ | Cylindricity | 37.59 | 37.52 | 0.53 |
| ⌀ | Diameter | 10.14 | 10.07 | 1.97 |
| ⊥ | Perpendicularity | 2.07 | 2.06 | 9.66 |

## Type 2 Gauge R&R

Type 2 tests involve multiple operators, multiple parts and multiple repetitions. Results give an indication of real world conditions, including factors such as gauge repeatability, fixture distortion and operator inconsistencies.

### Test conditions, type 2

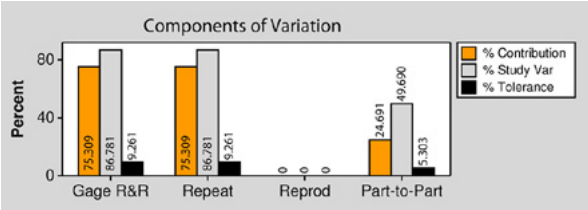
| | |
|---|---|
| Gauging cycle time: | 58 sec |
| Number of components: | 7 |
| Mastering frequency: | 7 |
| Number of operators: | 3 |
| Number of repetitions: | 4 |
| Total gauging operations: | 84 |

### Test results, type 2

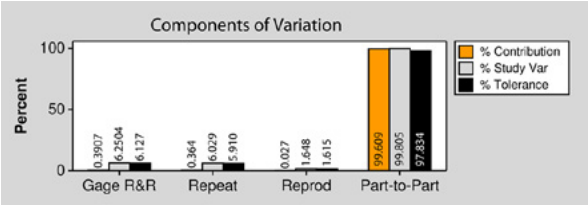
| | Feature measured | Tolerance | % of tolerance* |
|---|---|---|---|
| ⌭ | Cylindricity | 0.10 | 9.26 |
| ⌀ | Diameter | 0.02 | 6.13 |
| ⊥ | Perpendicularity | 0.10 | 9.28 |

*R&R of measuring process (using Equator) as % of tolerance

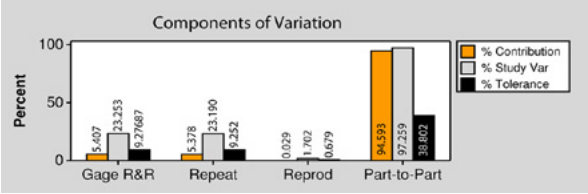
### ⌭ Cylindricity




### ⌀ Diameter




### ⊥ Perpendicularity



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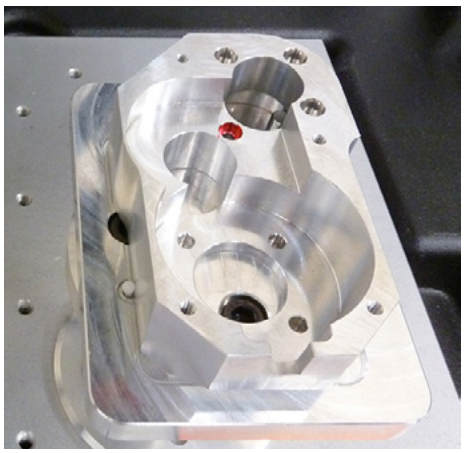
# Gauge R&R study – servo housing

## Industry: Drives



## Type 1 Gauge R&R

Type 1 tests are simple repeatability trials with one operator, one part and multiple repetitions. Results show gauge repeatability.

### Test conditions, type 1

| | |
|---|---|
| Gauging cycle time: | 23 sec |
| Number of repetitions: | 32 |

### Test results, type 1

| | Feature measured | Cg | Cgk | % of tolerance |
|---|---|---|---|---|
| ⟷ | X position | 6.56 | 6.41 | 3.05 |
| ⟷ | Y position | 9.76 | 9.65 | 2.05 |
| ◎ | Concentricity | 4.20 | 4.15 | 4.76 |
| ∅ | Diameter | 9.92 | 9.80 | 2.02 |

## Type 2 Gauge R&R

Type 2 tests involve multiple operators, multiple parts and multiple repetitions. Results give an indication of real world conditions, including factors such as gauge repeatability, fixture distortion and operator inconsistencies.

### Test conditions, type 2

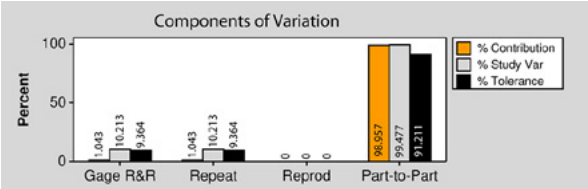
| | |
|---|---|
| Gauging cycle time: | 23 sec |
| Number of components: | 7 |
| Mastering frequency: | 7 |
| Number of operators: | 3 |
| Number of repetitions: | 4 |
| Total gauging operations: | 84 |

### Test results, type 2

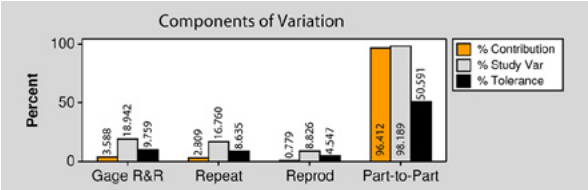
| | Feature measured | Tolerance | % of tolerance* |
|---|---|---|---|
| ⟷ | X position | 0.04 | 9.36 |
| ⟷ | Y position | 0.06 | 9.76 |
| ◎ | Concentricity | 0.08 | 6.97 |
| ∅ | Diameter | 0.07 | 8.65 |

*R&R of measuring process (using Equator) as % of tolerance

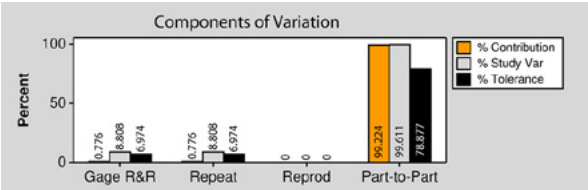
### ⟷ X position



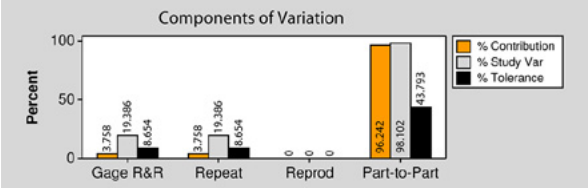

### ⟷ Y position




### ◎ Concentricity




### ∅ Diameter



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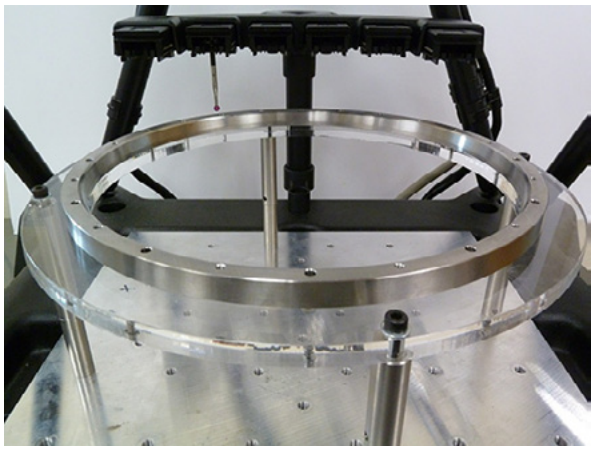
# Gauge R&R study – taper-mount steel ring

## Industry: Drives



## Type 1 Gauge R&R

Type 1 tests are simple repeatability trials with one operator, one part and multiple repetitions. Results show gauge repeatability.

### Test conditions, type 1

| | |
|---|---|
| Gauging cycle time: | 48 sec |
| Number of repetitions: | 32 |

### Test results, type 1

| | Feature measured | Cg | Cgk | % of tolerance |
|---|---|---|---|---|
| ∅ | Main bore diameter | 5.97 | 5.91 | 3.35 |
| ◯ | O/D circularity | 2.96 | 2.96 | 6.76 |
| ∠ | 30° cone angle | 2.86 | 2.77 | 6.98 |
| ▱ | Top face flatness | 8.37 | 8.37 | 2.39 |

## Type 2 Gauge R&R

Type 2 tests involve multiple operators, multiple parts and multiple repetitions. Results give an indication of real world conditions, including factors such as gauge repeatability, fixture distortion and operator inconsistencies.

### Test conditions, type 2

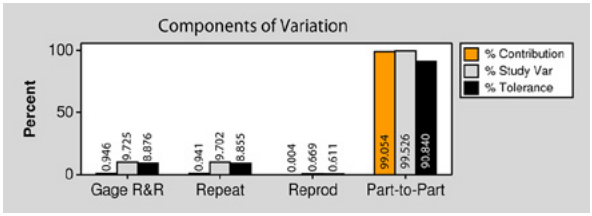
| | |
|---|---|
| Gauging cycle time: | 48 sec |
| Number of components: | 6 |
| Mastering frequency: | 6 |
| Number of operators: | 3 |
| Number of repetitions: | 5 |
| Total gauging operations: | 90 |

### Test results, type 2

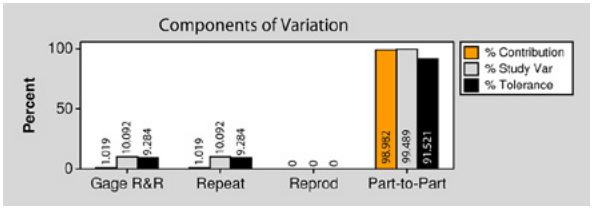
| | Feature measured | Tolerance | % of tolerance* |
|---|---|---|---|
| ∅ | Main bore diameter | 0.05 | 8.88 |
| ◯ | O/D circularity | 0.08 | 9.29 |
| ∠ | 30° cone angle | 1° | 9.33 |
| ▱ | Top face flatness | 0.10 | 6.42 |

*R&R of measuring process (using Equator) as % of tolerance

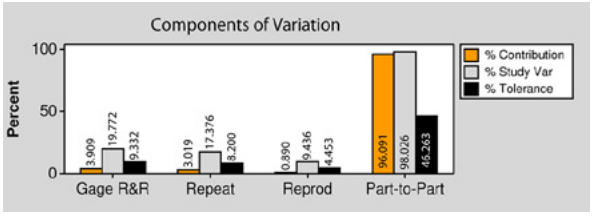
### ∅ Main bore diameter



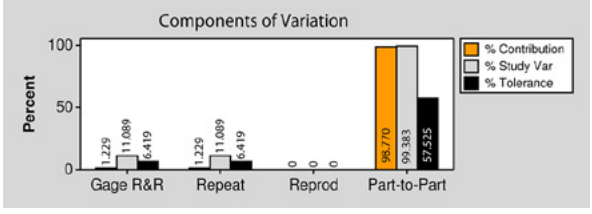

### ◯ O/D circularity




### ∠ 30° Cone angle




### ▱ Top face flatness



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# Gauge R&R study – formed C – section beams

## Industry: Drives


## Type 1 Gauge R&R

Type 1 tests are simple repeatability trials with one operator, one part and multiple repetitions. Results show gauge repeatability.

### Test conditions, type 1

| | |
|---|---|
| Gauging cycle time: | 55 sec |
| Number of repetitions: | 32 |

### Test results, type 1

| | Feature measured | Cg | Cgk | % of tolerance |
|---|---|---|---|---|
| ⊥ | Left to bottom plane | 6.56 | 6.41 | 3.05 |
| ⊥ | Right to bottom plane | 9.76 | 9.65 | 2.05 |
| // | Left to right plane | 4.20 | 4.15 | 4.76 |
| ▱ | Bottom plane flatness | 9.92 | 9.80 | 2.02 |

## Type 2 Gauge R&R

Type 2 tests involve multiple operators, multiple parts and multiple repetitions. Results give an indication of real world conditions, including factors such as gauge repeatability, fixture distortion and operator inconsistencies.

### Test conditions, type 2

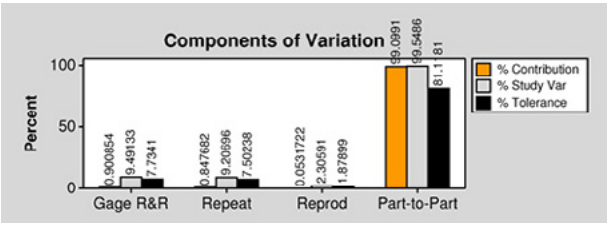
| | |
|---|---|
| Gauging cycle time: | 55 sec |
| Number of components: | 4 |
| Mastering frequency: | 4 |
| Number of operators: | 3 |
| Number of repetitions: | 7 |
| Total gauging operations: | 84 |

### Test results, type 2

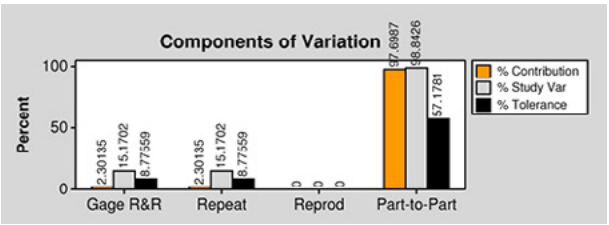
| | Feature measured | Tolerance | % of tolerance* |
|---|---|---|---|
| ⊥ | Left to bottom plane | 0.1 | 7.73 |
| ⊥ | Right to bottom plane | 0.1 | 8.78 |
| // | Concentricity | 0.1 | 8.43 |
| ▱ | Diameter | 0.1 | 7.80 |

*R&R of measuring process (using Equator) as % of tolerance

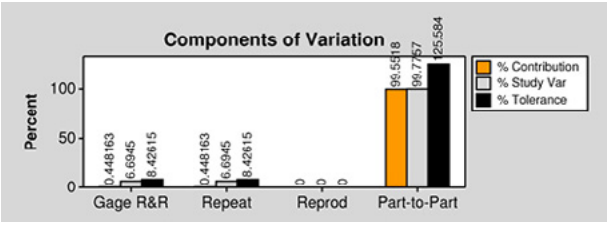
⊥ Left to bottom plane




⊥ Right to bottom plane




// Left to right plane




▱ Bottom plane flatness