# LBB Ultra-Precision Gage Heads



- **Spring and pneumatic extend versions**
- **Linear ball bearing front end**
- **Extremely long life cycle**
- **0.000004 inch [0.1µm] repeatability**
- **±0.02 to ±0.2 inch [±0.5 to ±5mm] ranges**
- **Replaceable tungsten carbide contact tip**
- **Double shielded LVDT**
- **Flexible cable, resistant to chemicals**
- **Fluoroelastomer boot** *(Model dependent)*
- **Selection of optional electrical connectors**

## DESCRIPTION

The **Linear Ball Bearing (LBB) Ultra-Precision** gage heads are dimensional gaging probes engineered for highly precise and repeatable measurements in quality control and metrology applications. The linear ball bearing system within the gaging probe reduces radial play to a minute level and minimizes friction for ultra-precise measurement.

The bearing assembly utilizes two circumferential rows of miniature balls. The balls ride on a non-rotating plunger. The plunger is hardened to Rockwell 65, hard-chrome plated and precision ground for optimal repeatability and resistance to brinelling. The contact end of the plunger has a removable tungsten carbide ball tip. Plunger and bearings are enclosed in a cylindrical housing, hand-honed and fit to the ball bearing assembly. Precision fitting provides for exceptional repeatability. With the bearings and housing matched in hardness, the plungers can better tolerate side loads for a longer life cycle.

A Linear Variable Differential Transformer (LVDT) is contained in the opposite end of the tubular housing. With no physical contact between its core and coils, the LVDT produces a highly repeatable output voltage proportional to displacement.

LBB gage heads feature a unique two-piece construction and are reparable should either probe structure or cables become damaged. A bend relief spring (on selected models) protects the cable at its exit. Positive mechanical stops prevent damage to the LVDT from impacts at the end of the contact tip in cases of over-stroke.

Spring-extend LBB gage heads feature user adjustable pre-travel/over-travel settings. Air-extend, spring-retract units require dry, oil-free air at 5 to 15PSI [0.34 to 1bar]; by varying air pressure, users can control the gaging force to ensure that the probes do not damage finely finished surfaces or distort delicate parts.

Measurement Specialties, Inc. (NASDAQ MEAS) offers many other types of sensors and signal conditioners. Data sheets can be downloaded from our web site at: http://www.meas-spec.com/datasheets.aspx

*MEAS acquired Schaevitz Sensors and the* ***Schaevitz™*** *trademark in 2000.*

## FEATURES

- 0.000004" (0.10µm) repeatability
- Housing diameter options: Smooth 0.315” [8mm] & 3/8” [9.5mm], or threaded 3/8”-40 UNS-2A
- Four electrical connector options (cable end)
- Optional contact tips *(4-48 UNF-2A threads only)*
- Adapter provided for radial cable exit *(Selected models)*
- Compatible with all our signal conditioners
- Calibration report supplied with each unit

## APPLICATIONS

- Online inspection of automotive parts
- Process feedback for numerically-controlled machine tools
- Dimensional inspection of precision parts
- Point-of-manufacture status of production process standards
- Automated data collection for factory SPC
- Robotics

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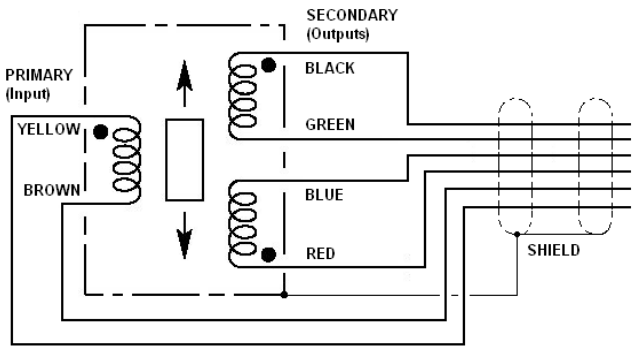
## PERFORMANCE SPECIFICATIONS

| ELECTRICAL SPECIFICATIONS | | | | | |
|---|---|---|---|---|---|
| | **LBBXXXXX-020** | **LBBXXXXX-040** | **LBBXXXXX-100** | **LBBXXXXX-100A** | **LBBXXXXX-200** |
| Stroke range | ±0.020 [±0.51] | ±0.040 [±1.02] | ±0.100 [±2.54] | ±0.100 [±2.54] | ±0.200 [±5.08] |
| Sensitivity, V/V/inch [mV/V/mm] | 6.5 [256] | 5.25 [207] | 5.25 [207] | 2.10±0.10 [82.7±4] | 3.8 [150] |
| Output at stroke ends, mV/V (*) | 141 | 210 | 525 | 210 | 760 |
| Phase shift | 6.5° | 3° | 3° | 14° | 5° |
| Input impedance (Primary) | 405Ω | 960Ω | 775Ω | 360Ω | 260Ω |
| Output impedance (Secondary) | 1320Ω | 2150Ω | 2150Ω | 250Ω | 710Ω |
| Null voltage (maximum) | 5mV | 10mV | 15mV | 10mV | 15mV |
| Test excitation frequency | 5kHz | 5kHz | 5kHz | 2.5kHz | 5kHz |
| Input (excitation) | 3VRMS sine wave @ 2.5 to 10kHz | | | | |
| Repeatability | 0.000004 inch [0.1µm] | | | | |
| Non linearity | ±0.2% of FR, maximum | | | | |
| Temp. Coefficient of Sensitivity | ±0.005% per ºF [±0.009% per ºC] | | | | |

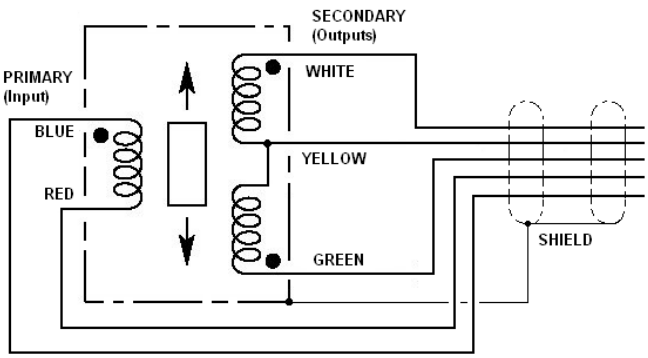
| ENVIRONMENTAL SPECIFICATIONS & MATERIALS | |
|---|---|
| Operating temperature | +40°F to +140°F [+5°C to +60°C] |
| Housing material | High carbon, heat-treated tool steel |
| Electrical connection | Shielded cable with polyurethane jacket, 6.5 feet [2m] long, six conductors, 32 AWG stranded Copper, PTFE insulated. **Shield is connected to case.** |
| Cable exit | Axial standard; adaptor provided with most units to allow for radial exit |
| IEC 60529 rating | IP60 |

*Notes:*
*All values are nominal unless otherwise noted*
*Electrical specifications are for the test frequency indicated in the table*
*Dimensions are in inch [mm] unless otherwise noted*
*FR: Full Range is 2X for ±X stroke*
*(*) Unit for output at stroke ends is millivolt per volt of excitation (input voltage)*

## WIRING SCHEMATIC




**LBBXXXXX-020, -040, and -100**
*Connect Blue to Green for differential output*




**LBBXXXXX-200**

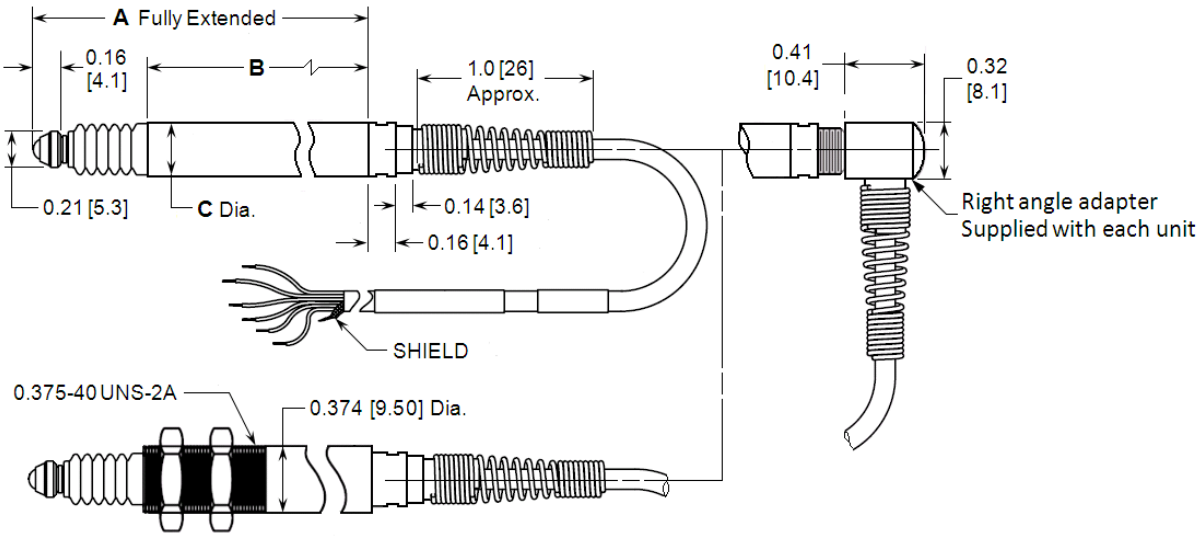
# LBB Ultra-Precision Gage Heads

## MECHANICAL SPECIFICATIONS

| SPRING ACTUATED (SPRING EXTEND) | | | | |
|---|---|---|---|---|
| | LBBXXXXX-020 | LBBXXXXX-040 | LBBXXXXX-100 | LBBXXXXX-200 |
| Dimension A (Fully Extended) | 1.69 [42.9] | 2.62 [66.5] | 2.62 [66.5] | 5.79 [147.0] |
| Dimension B (main housing length) | 1.37 [34.7] | 1.96 [49.8] | 1.96 [49.8] | 3.87 [98.3] |
| Dimension C (housing diameter) | 0.315 [8.00], 0.374 [9.50], or threaded (see drawing) | | | 0.315 [8.00] |
| Pre-travel | 0.002 to 0.005 [0.05 to 0.13] | 0.002 to 0.005 [0.05 to 0.13] | 0.002 to 0.005 [0.05 to 0.13] | 0.005 [0.13] |
| Over-travel (minimum) | 0.005 [0.13] | 0.005 [0.13] | 0.005 [0.13] | 0.045 [1.14] |
| Probe force at null position, oz [gram] | 2.5 [70] | 2.5 [70] | 2.5 [70] | 4.4 [125] |
| Contact tip thread size | 2.5mm | 4-48 UNF-2A | 4-48 UNF-2A | 2.5mm |

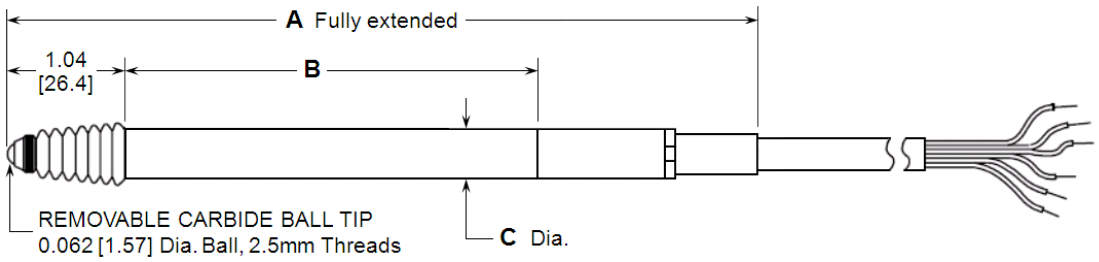
| AIR ACTUATED (AIR EXTEND, SPRING RETRACT) | | | | |
|---|---|---|---|---|
| | LBBXXXXX-020A | LBBXXXXX-040A | LBBXXXXX-100A | LBBXXXXX-200A |
| Dimension A (Fully Extended) | | | 4.25 [108.0] | |
| Dimension B (main housing length) | | | 3.56 [90.4] | |
| Dimension C (housing diameter) | | | 0.374 [9.50] or THD | |
| Pre-travel | | | 0.003 to 0.005 [0.08 to 0.13] | |
| Over-travel (minimum) | | | 0.11 [2.8] | |
| Probe force at null position, oz [gram] | | | Variable | |
| Contact tip thread size | | | 4-48 UNF-2B | |

## DIMENSIONS – SPRING ACTUATED



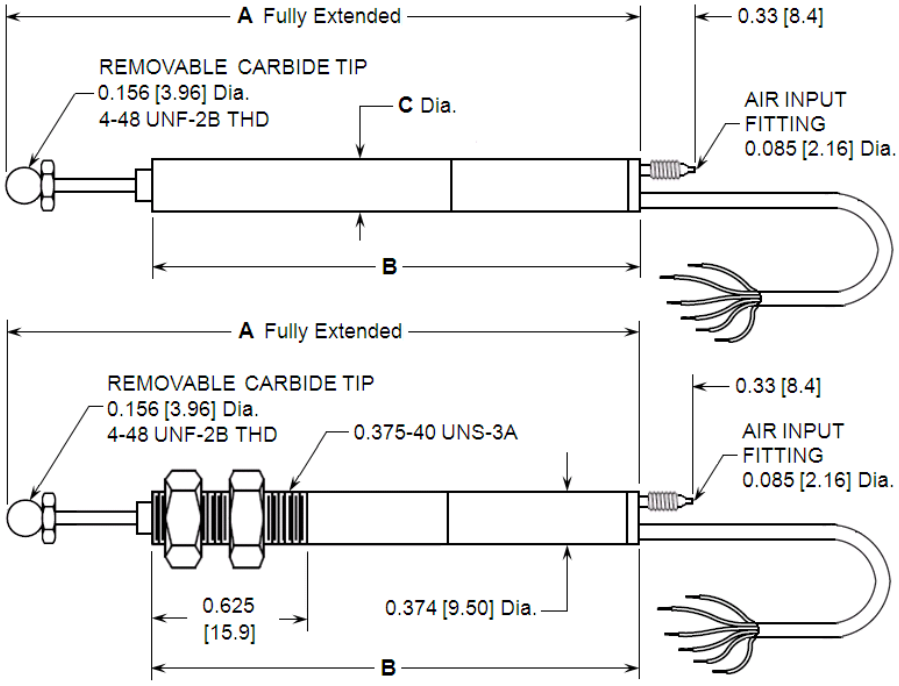

LBBXXXXX-020, -040, & -100
*Dimensions are in inches [mm]*

# LBB Ultra-Precision Gage Heads



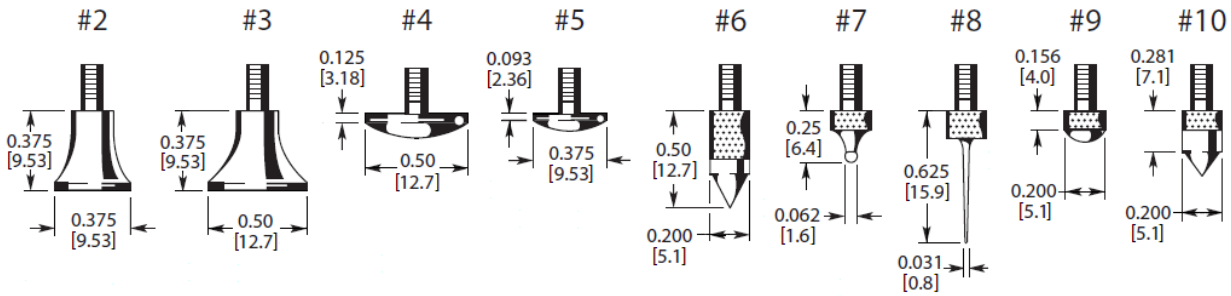

LBBXXXXX-200
*Dimensions are in inches [mm]*

## DIMENSIONS – AIR ACTUATED




LBBXXXXX-100A
*Dimensions are in inches [mm]*

## CONTACT TIP DIMENSIONS




*Threads are 4-48 UNF-2A only; dimensions are in inches [mm]*

# LBB Ultra-Precision Gage Heads

## ORDERING INFORMATION

| STANDARD GAGE HEADS *(All standard gage heads are supplied with tip removal tools)* | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type | Stroke range (inch) | Housing diameter (C) | | | | | |
| | | 0.315" [8mm] | | 3/8" [9.5mm] | | 3/8"-40 UNS-2A threaded | |
| | | Model | Part No | Model | Part No | Model | Part No |
| Spring | ±0.020 | LBB315PA-020 | 02350706-000 | LBB375PA-020 | 02350712-000 | LBB375TA-020 | 02350714-000 |
| | ±0.040 | LBB315PA-040 | 02350708-000 | LBB375PA-040 | 02350716-000 | LBB375TA-040 | 02350718-000 |
| | ±0.100 | LBB315PA-100 | 02350700-000 | LBB375PA-100 | 02350703-000 | LBB375TA-100 | 02350704-000 |
| | ±0.200 | LBB315PA-200 | 02350694-000 | LBB375PA-200 | *N/A* | LBB375TA-200 | *N/A* |
| Air | ±0.040 | LBB315PA-040A | *N/A* | LBB375PA-040A | *N/A* | LBB375TA-040A | *N/A* |
| | ±0.100 | LBB315PA-100A | *N/A* | LBB375PA-100A | 02350679-000 | LBB375TA-100A | 02350695-000 |
| | ±0.200 | LBB315PA-200A | *N/A* | LBB375PA-200A | *N/A* | LBB375TA-200A | *N/A* |

| OPTIONS | |
|---|---|
| **Installed electrical connectors** *(change suffix of above part numbers to specify an option)* | **Part Number** |
| Bendix type PTO6A-10-6P (SR) | XXXXXXXX-001 |
| DB-9P (to connect to our ATA-2001 signal conditioner) | XXXXXXXX-004 |
| Switchcraft type 125CL5-M compatible with SYS-96 Dimensional Data Acquisition System | XXXXXXXX -005 |
| Switchcraft-type 05BL5-M to connect to our MP-2000 readout/controller | XXXXXXXX -007 |

**ACCESSORIES** *(Also refer to our "Options and Accessories for Gage Heads" brochure)*

| Description | Part Number | | Description | Part Number | | Description | Part Number |
|---|---|---|---|---|---|---|---|
| Contact Tip 2 | 67010005-000 | | Contact Tip 5 | 67010007-000 | | Contact Tip 8 | 67010010-000 |
| Contact Tip 3 | 67010006-000 | | Contact Tip 6 | 67010008-000 | | Contact Tip 9 | 67010001-000 |
| Contact Tip 4 | 67010002-000 | | Contact Tip 7 | 67010009-000 | | Contact Tip 10 | 67010011-000 |

## TECHNICAL CONTACT INFORMATION


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