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 dependant)*
- **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.

*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

LBB Ultra-Precision Gage Heads

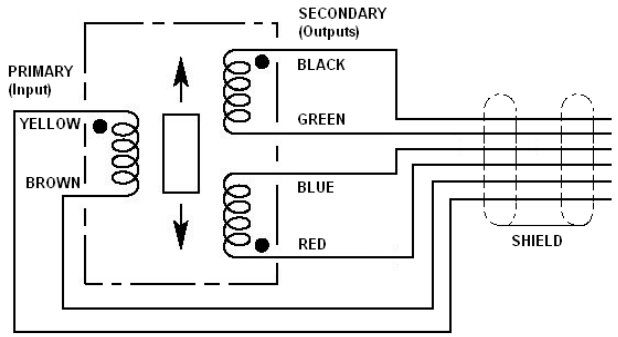
PERFORMANCE SPECIFICATIONS

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]				

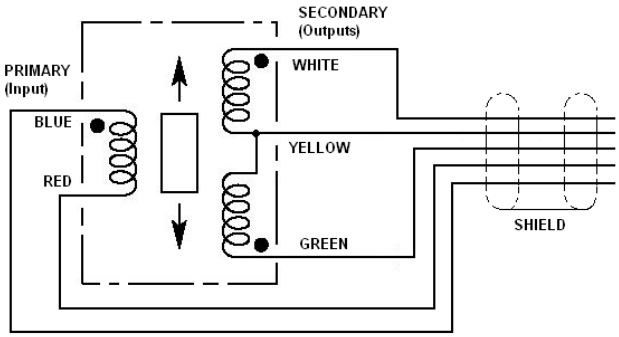
ENVIRONMENTAL SPECIFICATIONS & MATERIALS	
Operating temperature	+40°F to +140°F [+5°C to +60°C]
Housing material	High carbon, heat-treated tool steel
Electrical connection	Shielded cable with polyurethane jacket, 6.5 feet [2m] long with six conductors, 32 AWG stranded Copper, PTFE insulated
Cable exit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

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

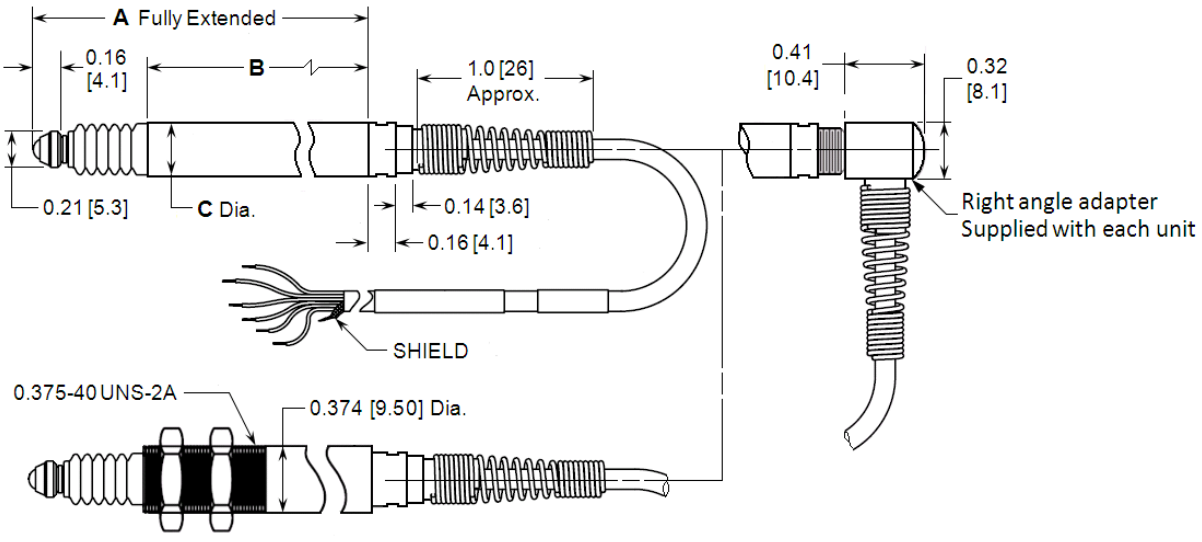
LBB Ultra-Precision Gage Heads

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

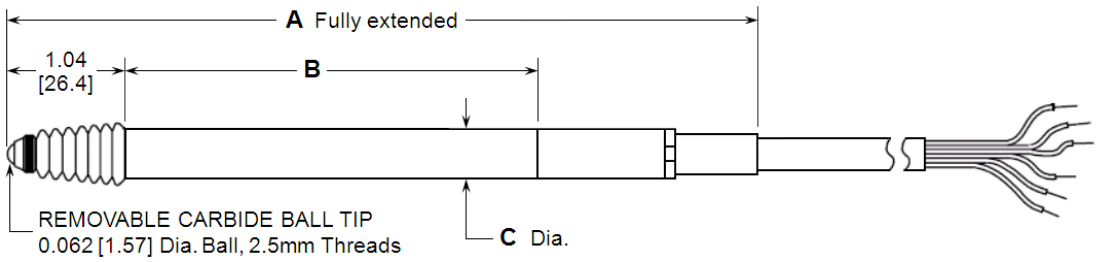
AIR ACTUATED (AIR EXTEND, SPRING RETRACT)				
	LBBXXXXX-020A	**LBBXXXXX-040A**	**LBBXXXXX-100A**	**LBBXXXXX-200A**
Dimension A (Fully Extended)	*In development*	*In development*	4.25 [108.0]	*In development*
Dimension B (main housing length)			3.56 [90.4]	
Dimension C (housing diameter)			0.374 [9.50] 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



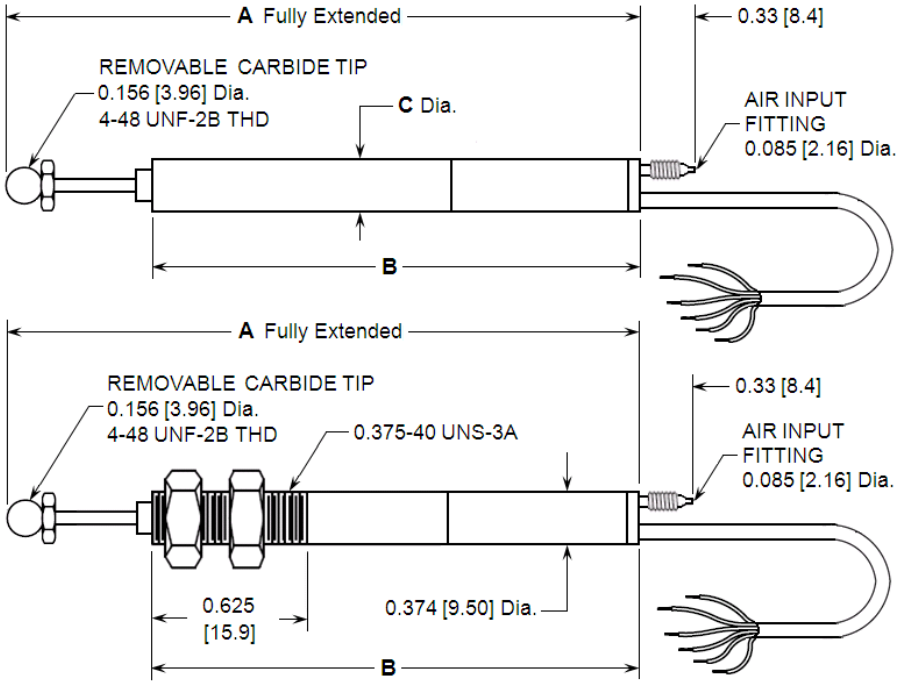
LBBXXXXX-020, -040, & -100
Dimensions are in inches [mm]

LBB Ultra-Precision Gage Heads



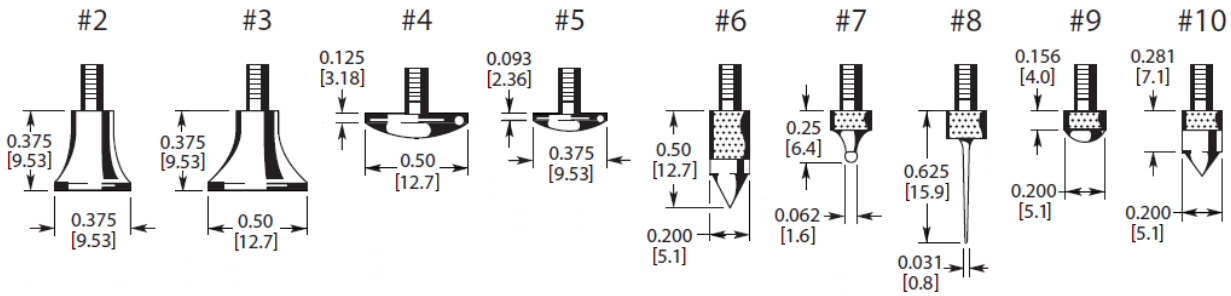
LBBXXXXX-200
Dimensions are in inches [mm]

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	*In development*	LBB375TA-200	*In development*
Air	±0.040	LBB315PA-040A	*In development*	LBB375PA-040A	*In development*	LBB375TA-040A	*In development*
	±0.100	LBB315PA-100A	*In development*	LBB375PA-100A	02350679-000	LBB375TA-100A	02350695-000
	±0.200	LBB315PA-200A	*In development*	LBB375PA-200A	*In development*	LBB375TA-200A	*In development*

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 *(Refer to our "Options and Accessories for Gage Head" data sheet)*

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