

PPA/PPD Series Precision Gage Heads

Non-Contacting Design for $\pm 0.050"$ to $\pm 1.00"$ Range Measurement



The Schaevitz® non-contacting gage head consists of an LVDT and a pneumatic servo which maintains a constant space between the work piece and a nozzle follower. The LVDT measures the nozzle displacement as it tracks the profile of the part and converts this movement to an electrical signal that is directly proportional to thickness. The LVDT inherently has high accuracy, excellent repeatability, infinite resolution, and high sensitivity; directly coupling the LVDT core to the nozzle follower results in a mechanism without cams, linkages or other similar moving parts to affect the measurement.

The Schaevitz® design overcomes the limitations of other thickness measurement devices. Contacting devices can mar or tear fragile material; proximity devices have very limited range and only work on ferrous or conductive materials. Optics require reflective surfaces for operation; capacitance units are affected by humidity; nuclear-type devices work only on material with constant density; and the range of measurement of air gages is very small. In contrast to these limitations, Schaevitz® non-contacting gage heads accurately measure the physical variables (such as thickness, height, diameter, etc.) of materials without surface contact.

Probes can follow any combination of change in surface thickness (displacement) versus frequency (speed of work piece) to a maximum of $0.125"/\text{sec}$. ($3.17 \text{ mm}/\text{sec}$). Accuracy improves as displacement and/or frequency decreases. These gage heads permit accurate measurement of such diversified materials as metal, plastic, paper and film. Units gage over a range of $\pm 0.050"$ to $\pm 1.00"$ ($\pm 1.27 \text{ mm}$ to 25.4 mm).

Our non-contacting gage heads are manufactured as Standard or Booster configurations. Standard configurations are ideal for general applications with

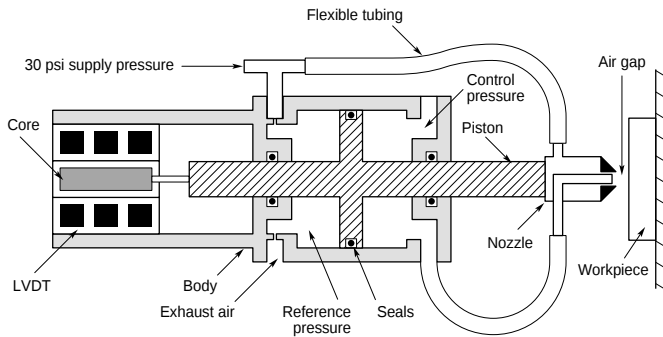
material that can tolerate a gaging force of up to 15 to 20 grams. In this unit, the nozzle-to-surface gap is $0.003"$. Booster units offer a large air gap ($0.015"$) for applications involving delicate materials. The booster functions as an amplifier for detection of thickness changes at greater nozzle-to-surface spacing.

Features

- ☐ **High sensitivity resolves changes in thickness to $0.0001"$**
- ☐ **Wide measurement range for thickness variations to $\pm 1.000"$**
- ☐ **Low air-flow requirement eliminates need for precision air regulation**
- ☐ **Calibration certificate supplied with every gage head**
- ☐ **Compatible with all Schaevitz® signal conditioners**
- ☐ **Non-contacting; never contacts part being gaged**
- ☐ **Low gaging force down 1 gram**
- ☐ **Rugged simple construction with only one moving part**
- ☐ **Easily cleaned; not affected by dirt**

Applications

- ☐ **Delicate materials**
- ☐ **Metals, plastics and films that scratch easily**



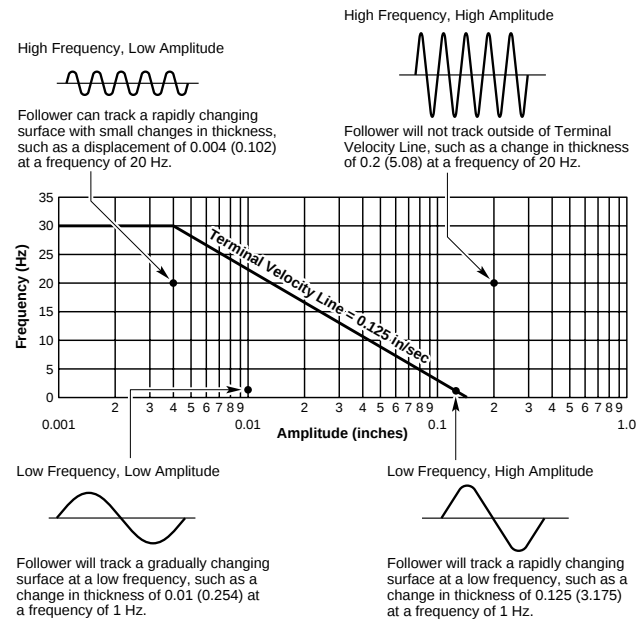
Simplified cross-section of pneumatic servo-follower coupled to LVDT.

The Schaevitz® non-contacting gage head consists of a double acting air cylinder with a pneumatic servo-follower nozzle on one end and an LVDT on the other. The double acting cylinder combined with the closed-loop servo mechanism of the follower nozzle maintains a constant air gap between the work piece and the gage head; any repositioning of the nozzle to maintain the air gap constant is translated by the LVDT into an electrical signal that is directly proportional to the variation in thickness of the work piece.

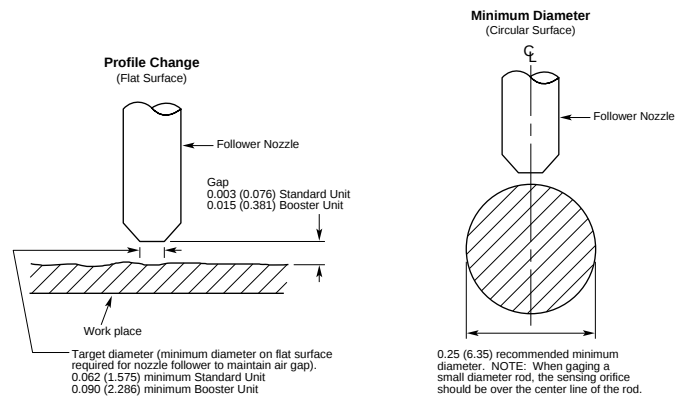
Compressed air, regulated to approximately 30 psi, is applied to the reference pressure chamber through the supply air inlet orifice. The supply air is also connected to the nozzle, where it bleeds to atmosphere through the sensing orifice. The nozzle is designed so that a back pressure, developed by the discharging supply air, varies with the gap between the sensing orifice and the surface being measured. This gap-dependent pressure is fed back to the control pressure chamber.

At a particular gap, typically 0.003 inches, the control pressure on one side of the piston equals the reference pressure on the other side, and the piston does not move. If the gap changes because of dimensional or positional changes in the gaged surface, the control pressure changes accordingly, repositioning the piston and nozzle and restoring the gap. For example, if the air gap becomes smaller due to greater thickness of the work piece, the nozzle back pressure increases, and the piston and nozzle assembly will move to re-establish the original back pressure. It is this change in position that the direct-coupled LVDT converts to an analog signal, directly proportional to nozzle displacement.

Units are available in AC or DC-operated versions to meet particular system requirements. AC-operated units utilize external signal conditioning; DC units incorporate all the necessary signal conditioning within the housing of the gage head.



Standard Schaevitz® LVDT non-contacting gage heads can follow any combination of change in surface thickness (displacement) vs. frequency (speed of work piece) to a maximum of 0.125 in/sec. Accuracy improves as displacement and/or frequency decrease.



Accuracy of the Schaevitz® non-contacting gage depends on many variables: speed of work piece, shape and size of particles (i.e. sandpaper or grinding wheels), slope or profile change of work piece, and target area.

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Specifications

Excitation	AC version: 5 V rms (nom) DC version: $\pm 15\text{VDC}$, $\pm 30\text{mA}$ (max)
Input Air Pressure	30 psi (nom)
Air Flow	Standard: 0.2 cfm Booster: 0.4 cfm
Gaging Range	0.05" to $\pm 1.0''$ (± 1.27 mm to ± 25.4 mm)
Linearity	$\pm 0.25\%$ FRO
Repeatability	Standard: 0.0001" with 0.002" air gap (.00025 mm with 0.05 mm air gap) Booster: 0.0002" with 0.015" air gap (0.005 mm with 0.38 mm air gap)
Operating Temperature Range	AC version: 0°F to 160°F (-18°C to 70°C) DC version: 32°F to 160°F (0°C to 70°C)
Gaging Force	Standard: 15 to 20 g Booster: 1 to 2 g
Housing Material	LVDT housing: 400 series stainless steel; servo housing: aluminum

AC Operated*

Gaging Range (in)	Impedance (ohms) @ 2.5 kHz		Output Sensitivity (mV/0.001"/V input) 2.5 kHz	Linearity (% Full Range)
	Input	Output		
± 0.050	430	950	4.2	± 0.25
± 0.125	1,710	1,820	2.4	± 0.25
± 1.000	900	2,100	0.84	± 0.25

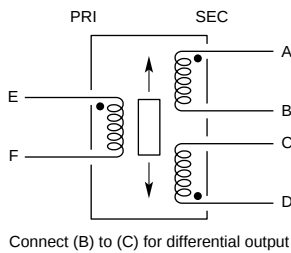
*5V rms nominal input

DC Operated*

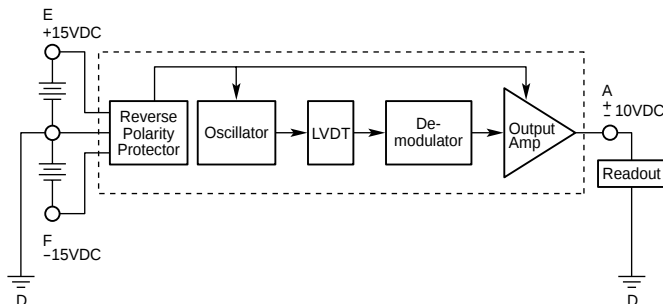
Gaging Range (in)	Output	Output Impedance (ohms)	Min. Load Resistance (k ohms)	Linearity (% Full Range)
± 0.050	± 10 VDC full scale	100	2	± 0.24
± 0.125	± 10 VDC full scale	100	2	± 0.25
± 1.000	± 10 VDC full scale	100	2	± 0.25

* ± 15 VDC nominal input, ± 20 mA

Wiring – AC Models

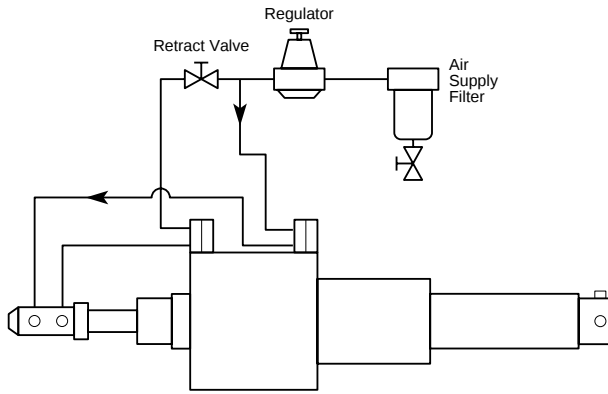


Wiring – DC Models



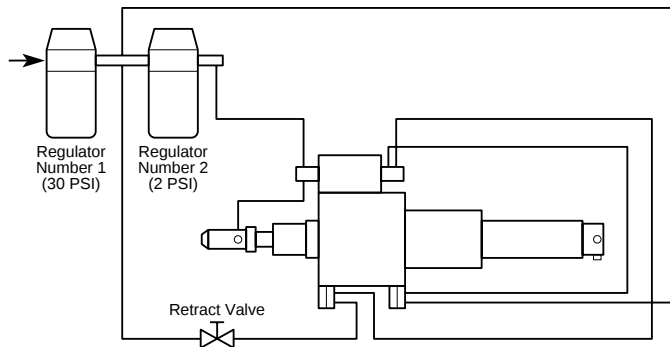
Standard Model

For general applications with material that can tolerate a gaging force of up to 15–20 grams. In this unit, the nozzle-to-surface gap is 0.003 inch, and the gaging range is equal to the total mechanical stroke.



Booster Model

Larger air gap (0.015 inch) for those applications involving delicate materials which require a maximum gaging force of 2 grams. The booster functions as an amplifier which allows detection of thickness changes at greater nozzle-to-surface spacing. As in the standard unit, the gaging range is equal to the total mechanical stroke.



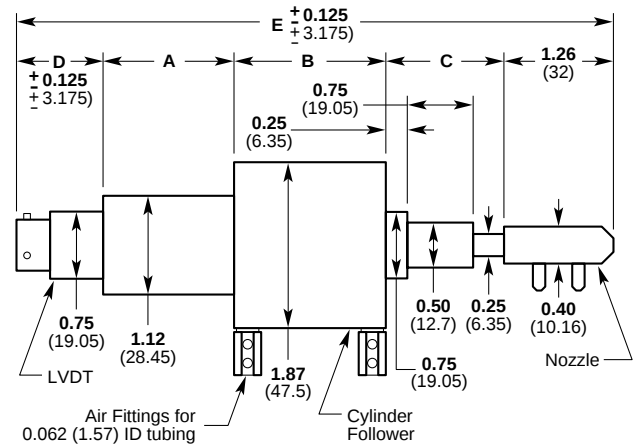
How to Order

Specify the appropriate model number followed by the desired standard or booster configuration suffix (S – Standard; B – Booster). For example: PPA-050-S.

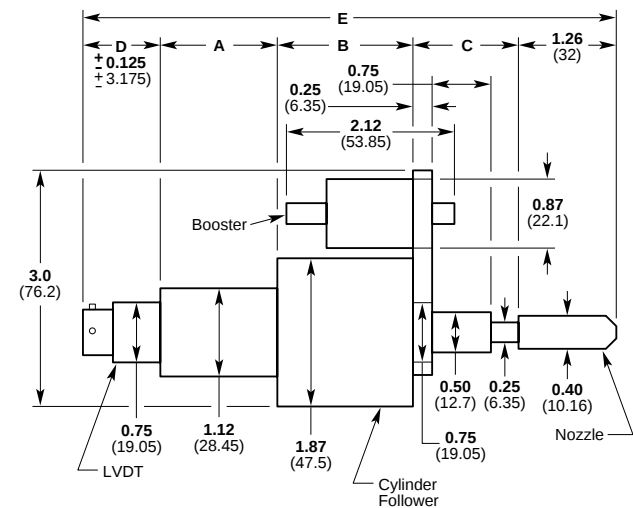
Model Number	Operation	Range
PPA-050	AC	±0.050" (1.27mm)
PPA-125	AC	±0.125" (3.18mm)
PPA-1000	AC	±1.00" (25.4mm)
PPD-050	DC	±0.050" (1.27mm)
PPD-125	DC	±0.125" (3.18mm)
PPD-100	DC	±1.00" (25.4mm)

Dimensions in (mm)

Standard Models



Booster Models



Standard and Booster Models

Model Number	Operation	Range	A	B	C	D	E
PPA-050	AC	±0.050" (1.27mm)	1.50	1.75	1.37	1.05	6.87
PPA-125	AC	±0.125" (3.18mm)	1.50	1.75	1.37	1.87	7.75
PPA-100	AC	±1.00" (25.4mm)	5.25	3.50	3.12	4.75	17.87
PPD-050	DC	±0.050" (1.27mm)	1.50	1.75	1.37	1.80	7.62
PPD-125	DC	±0.125" (3.18mm)	1.50	1.75	1.37	3.62	8.50
PPD-100	DC	±1.00" (25.4mm)	5.25	3.50	3.12	5.50	18.62