

# NPH Series

## Solid State

## Pressure Sensor

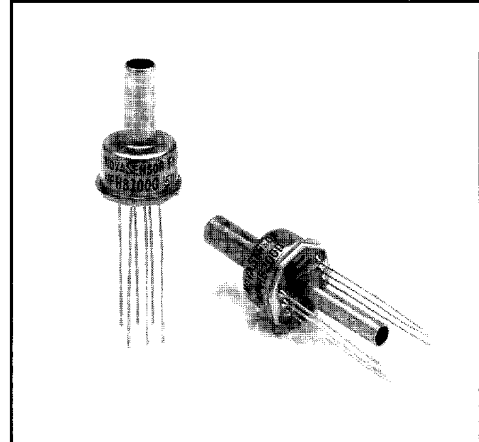
### Medium Pressure

#### APPLICATIONS

- Process control, P-to-I converters
- Pneumatic control systems
- HVAC controls
- Biomedical: infusion pumps, sphygmomanometers, respirators
- Aerospace: altimeters, barometers, cabin pressure sensors
- Computer peripherals

#### FEATURES

- Solid state, high reliability
- Standard TO-8 package suitable for PC board mount
- Low cost, small size
- Available in gage, absolute, and differential pressure versions
- Media compatible with noncorrosive gases and dry air
- Output signal of 100mV @ 1.5mA
- Thermal accuracy FSO 0.4% typical
- Overpressure capability to 4 times maximum rated pressure
- Three standard ranges: 0-15, 0-30, and 0-100 psi
- Nonlinearity 0.05% FSO typical
- Standard 3/16" OD pressure port
- Ceramic substrate with temperature compensation resistors is standard
- Custom configurations and other pressure ranges available. Please consult factory.



#### DESCRIPTION

An integrated circuit silicon sensor chip is housed in a standard TO-8 electrical package which is printed circuit board mountable.

The latest techniques in VLSI and micromachining have been used to ion-implant piezoresistive strain gages into a Wheatstone bridge configuration which is integrally formed on a micromachined silicon diaphragm. As with all Lucas NovaSensor silicon sensors, the NPH Series employs SenStable® processing technology, providing excellent output stability. Constant current excitation to the sensor produces a voltage output that is linearly proportional to the input pressure.

The user can provide standard signal conditioning circuitry to amplify the 100mV output signal. The sensor is compatible with most noncorrosive gases and dry air.

A laser-trimmed, thick-film resistor network on a hybrid ceramic substrate provides temperature compensation.

**NPH Series****Solid State Pressure Sensor — Medium Pressure****T-65-13****OPERATING  
CHARACTERISTICS**

PARAMETER	VALUE	UNITS	NOTES
-----------	-------	-------	-------

**GENERAL**

Pressure Range	0-100	kPa	≈ 0-15 psi
	0-200	kPa	≈ 0-30 psi
	0-700	kPa	≈ 0-100 psi
Maximum Pressure	4 x		rated pressure <sup>(9)</sup>

**ELECTRICAL @ 25°C (77°F) unless otherwise stated**

Input Excitation	1.5	mA	2mA max.
Insulation Resistance	10 <sup>7</sup>	Ω	@ 50 V <sub>DC</sub>
Input Impedance	4,000	Ω	± 20%
Output Impedance	5,000	Ω	± 20%
Bridge Resistance	5,000	Ω	± 20%

**ENVIRONMENTAL**

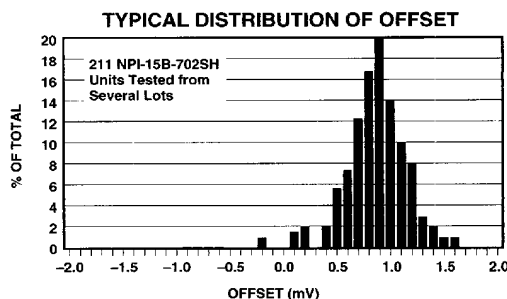
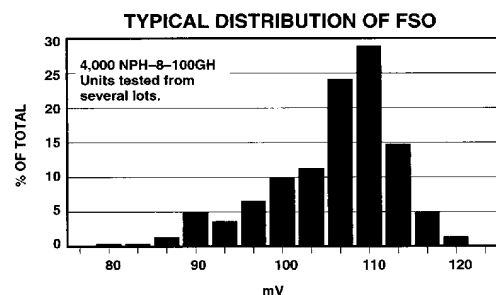
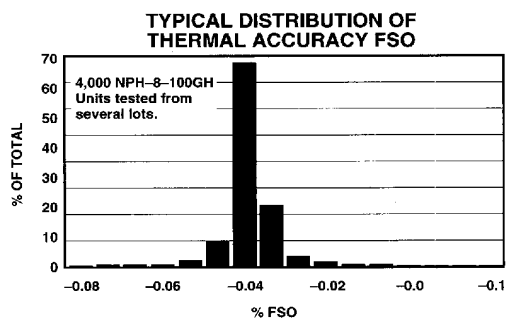
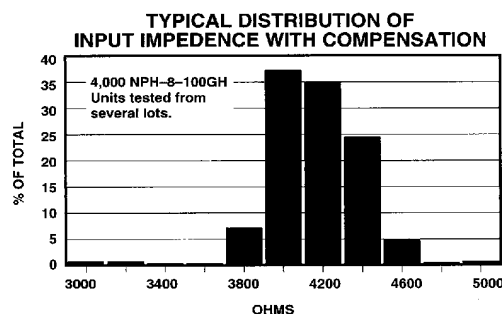
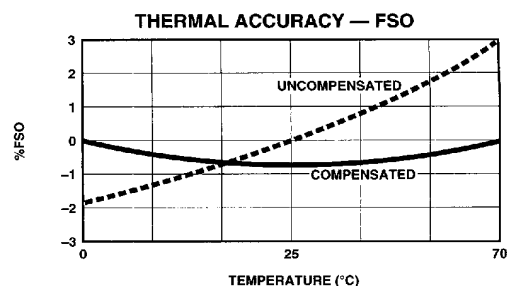
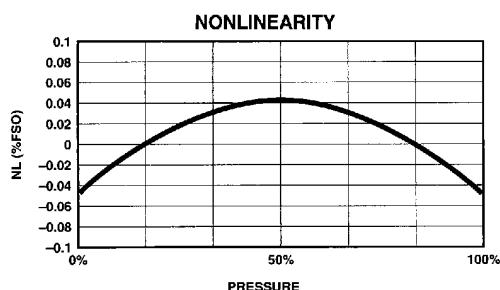
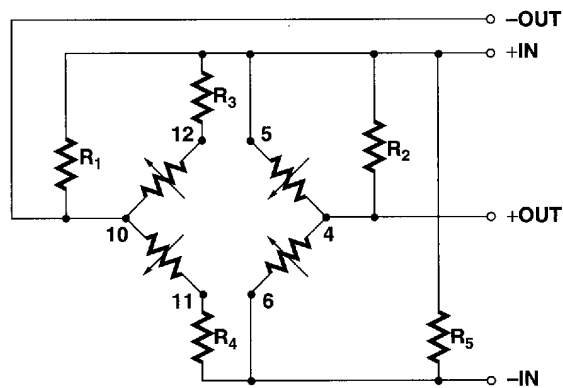
Temperature Range			
Operating <sup>(10)</sup>	-40 to +125	°C	-40° to +257°F
Compensation Range	0 to +70	°C	+32° to +158°F
Vibration	10	g <sub>RMS</sub>	20 to 2000Hz
Shock	100	g	11 milliseconds
Life (Dynamic Pressure Cycle)	100 x 10 <sup>6</sup>	cycles	

**MECHANICAL**

Weight	<5	grams	<0.2 oz.
Media Compatibility	Noncorrosive gases and dry air		
Wetted Materials	Top Port:	Nickel, gold plated Kovar, silicone gel, RTV, silicon and glass.	
	Bottom Port:	Gold plated Kovar, silicon, glass and RTV. <sup>(11)</sup>	

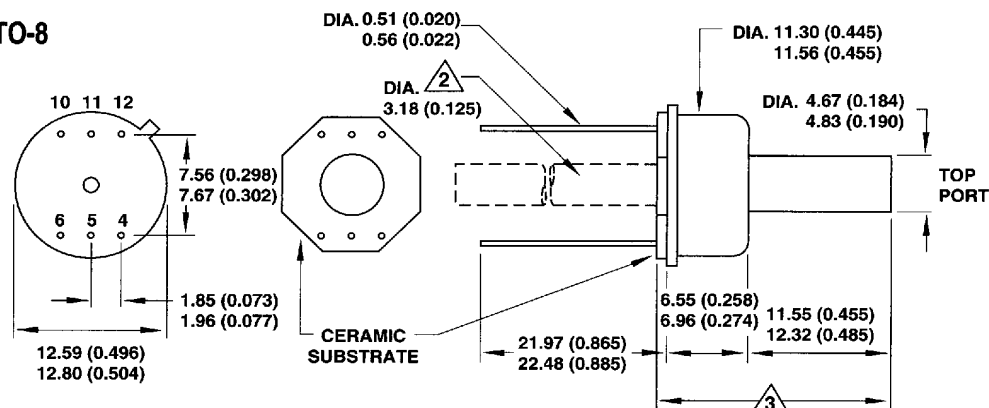
Performance <sup>(6)</sup>		Compensated <sup>(1)</sup>			
100, 200 & 700 kPa					
Parameter	Units	Min.	Typ.	Max.	Notes
Offset	mV	−2	±1	2	
Full Scale Output	mV	75	100	125	2
Linearity	%FSO	−0.1	0.05	0.1	3
Hysteresis and Repeatability	%FSO	−0.05	0.01	0.05	
Thermal Accuracy of Offset					
100 kPa	%FSO	−0.6	0.4	0.6	4
200 & 700 kPa	%FSO	−0.5	0.2	0.5	4
Thermal Accuracy of FSO					
100 kPa	%FSO	−0.6	−0.4	0.6	4
200 & 700 kPa	%FSO	−0.5	−0.2	0.5	4
Thermal Hysteresis	%FSO	−0.1	±0.05	0.1	5
Short-Term Stability of Offset	μV/V		±5		6
Short-Term Stability of FSO	μV/V		±5		6
Long-Term Stability of Offset	%FSO		±0.1		7
Long-Term Stability of FSO	%FSO		±0.1		7

- Notes:**
- Performance with offset, thermal accuracy of offset, and thermal accuracy of FSO compensation resistors.
  - FSO measured with 1.5mA input excitation.
  - Best fit straight line.
  - 0 to +70°C with reference to 25°C
  - 0 to +70°C
  - Normalized offset/bridge voltage—100 hrs.
  - 1 year.
  - All values measured at 25°C and at 1.5mA, unless otherwise noted.
  - Topside pressure. Backside pressure maximum pressure is 250 psi or 4x rated pressure, whichever is less.
  - Reduced performance outside compensation range.
  - Backside differential tube is nickel.

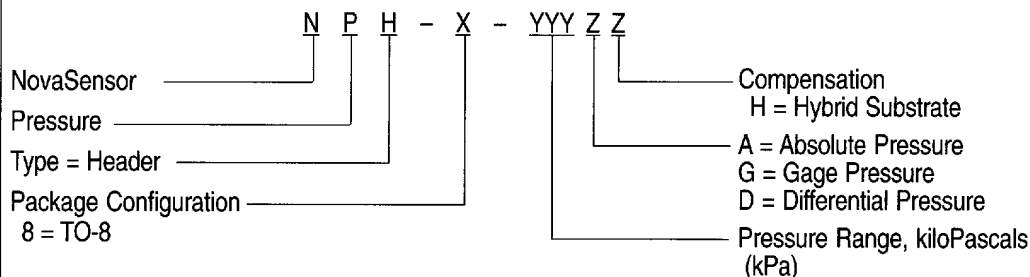
**NPH Series****Solid State Pressure Sensor — Medium Pressure****T-65-13****TYPICAL  
PERFORMANCE  
CHARACTERISTICS****SCHEMATIC  
DIAGRAMS****TERMINAL  
CONNECTIONS**

4	+OUT
5	+IN
6	-IN
10	-OUT
11	N/C
12	N/C

Note: Pin #5 is connected to chip substrate.

**NPH Series****Solid State Pressure Sensor — Medium Pressure****PACKAGE  
DIAGRAMS****TO-8****T-65-13**

- NOTES:**
1. All dimensions in millimeters (inches).
  2. Backside differential tube is  $17.15 \pm 0.051$  ( $0.675 \pm 0.010$ ) long, measured from back of header to tip, not from backplane of ceramic to tip. Ceramic is  $0.635 \pm 0.051$  ( $0.025 \pm 0.002$ ) thick and gap between ceramic and header is 0.762 (0.030) max.
  3. Length is  $19.33 - 0.635/+0.889$  ( $0.761 - 0.025/+0.035$ ) for gage type and  $19.33 - 0.635/+1.40$  ( $0.761 - 0.025/+0.055$ ) for differential type

**ORDERING**

**Options:** A 3/16" OD pressure port is standard. Lead length of 0.875" is standard. Please consult factory for options.

**Ordering Example:** Assume a requirement for a temperature compensated gage pressure transducer with a 0–30 kiloPascal range in a TO-8 package. Model number would be: NPH-8-030GH.

**Sales Terms:** Lucas NovaSensor standard sales terms apply. Prices and specifications are subject to change without notice.

**Warranty:** Lucas NovaSensor warrants its products against defects in material and workmanship for 12 months from date of shipment. Products not subjected to misuse will be repaired or replaced. THE FOREGOING IS IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES. Lucas NovaSensor reserves the right to make changes to any product herein and assumes no liability arising out of the application or use of any product or circuit described or referenced herein.

Lucas NovaSensor  
1055 Mission Court  
Fremont, CA 94539

**Lucas**

Telephone: 510-490-9100  
Fax: 510-770-0645  
Telex: 990010

Rev.1192