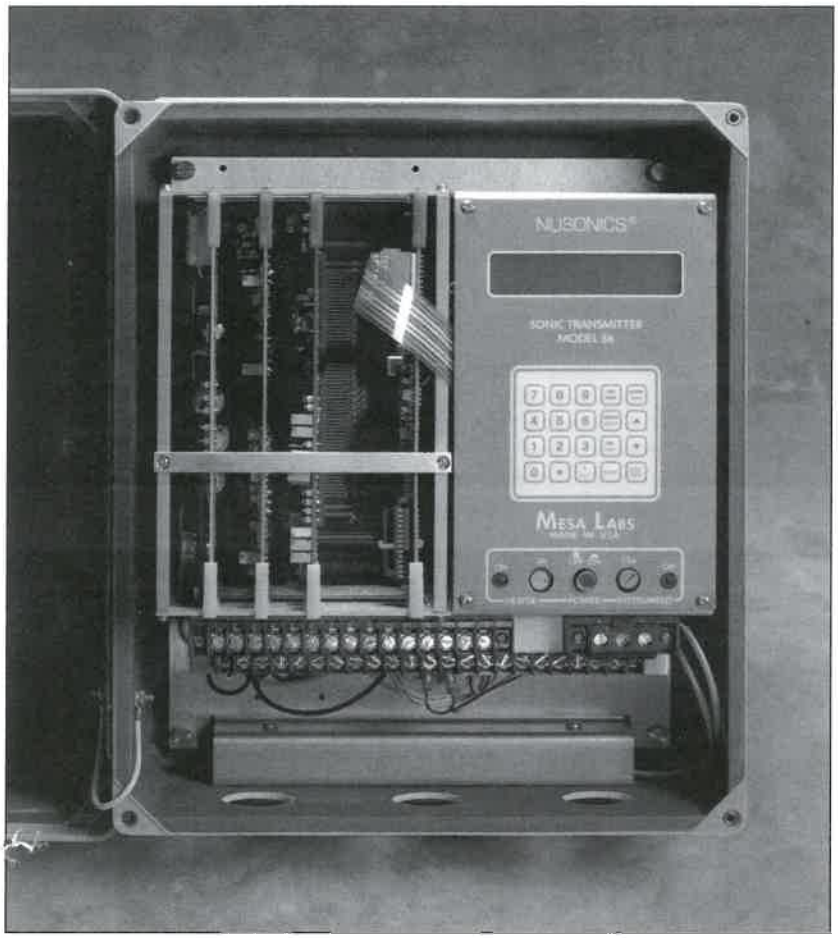


NuSonics Division

SYSTEMS INTEGRATORS

Model 86 PID

Pipeline Interface Detector

- Detects all gasoline – gasoline interfaces
- Designed for automatic batching operation
- Wide range of products – LPG's to crude oils
- Displays in API, SGU or sound velocity units
- Automatic temperature and pressure compensation
- Instantaneous response
- RS-232 port for remote data communication
- Keypad control – menu driven display
- Dual range – each with isolated 4-20mA output
- Programmable high and low alarms with relays

MODEL 86 PID

Figure 1 – RETRACTOR WITHDRAWN

Introduction. The Mesa Laboratories, Inc., NuSonics' Model 86 Pipeline Interface Detector (PID) is a third generation instrument that incorporates all the features and advantages made possible by microcomputers. Based on years of experience in pipeline instrumentation, the Model 86 PID combines the proven reliability of NuSonics electro-acoustic transducer technology to give the ultimate in performance to meet exacting specifications for interface detection.

The NuSonics Model 86 PID determines liquid composition by measuring sound velocity, which is unique and repeatable for a liquid. The relationship between sound velocity, temperature and pressure is different for every liquid. Once this relationship is known for a liquid, sound velocity can be used to monitor changes in liquid composition and interfaces between liquids in a pipeline with greater precision than with other measuring instruments. The Model 86 PID can detect small changes in liquid composition and interfaces between liquids that could otherwise be missed.

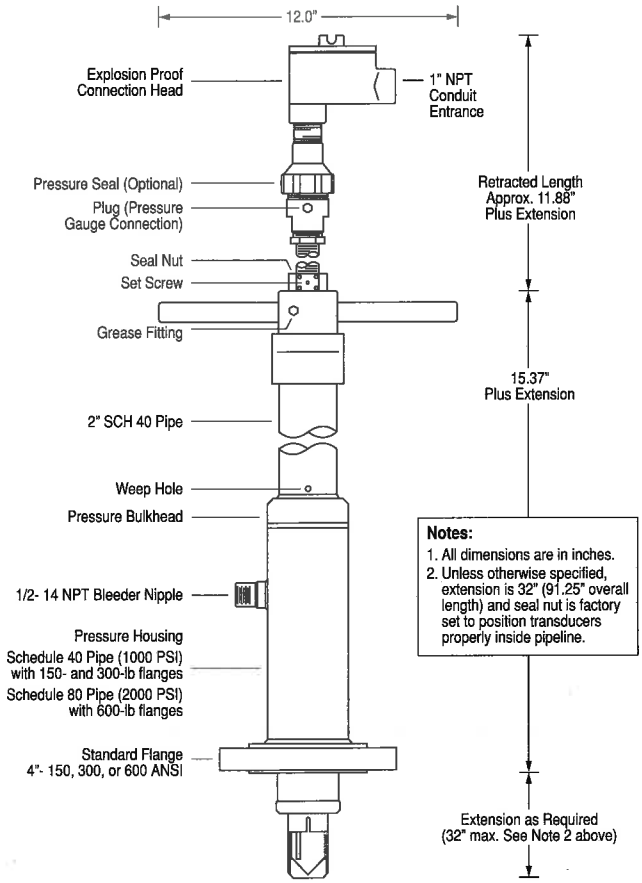


Figure 2 – PROBE RETRACTOR OUTLINE DRAWING

Applications. The Model 86 PID is utilized on new or existing pipelines and plants that need to detect interfaces between various liquids that are pumped through the same pipeline. Currently, NuSonics Model 86 PID is used at several hundred sites throughout the world and has proven itself with a wide variety of products and situations due to its high sensitivity and fast response time.

Operation. The NuSonics Model 86 PID consists of a sensing probe assembly and a transmitter. The probe assembly is installed into the pipeline. It consists of a sound velocity transducer, platinum-resistance temperature probe and solid state pressure sensor. The probe assembly, containing the three sensing elements, may be mounted into the pipeline on a 4", 6" or 8" ANSI 150#, 300#, or 600# flange assembly as shown in Figure 1. The length of the probe assembly can vary from 7.5" to 72" to meet the installation requirements.

Alternately, the probe assembly may be mounted in a probe retractor (Figure 2) with a 4"-150#, 300# or 600# flange, permitting initial hot tap installation and withdrawal of the probe assembly without shutting off the flow or the pipeline. The probe retractor can be mounted on the user furnished 4"valve. The unit is provided with 25 ft. cable (std) and maximum cable length can be up to 100 feet.

If the probe assembly is to be installed in a horizontal pipeline, it is advisable to install it within 45 degrees above or below the horizontal plane. This minimizes the tendency for entrained air bubbles to become trapped under the sound velocity transducer of the probe assembly. Pumps and other off line sampling schemes are not required with the NuSonics probe assembly, resulting in significant initial cost savings.

The Model 86 PID transmitter is mounted in a NEMA 4X enclosure with a window to view the keypad and LCD, 2 line, 16 character display. An optional NEMA 7 enclosure is available. The transmitter's keypad and menu driven display allows the operator to set up the instrument for maximum performance. The displays are in API, SGU, percent of span, temperature, pressure or sound velocity, (m/sec) units.

A RS-232 port is available for remote data link communication. A 4 to 20 mA output signal is standard and the unit is provided with three programmable relays for fault indication, high set point and low set. The Model 86 PID transmitter can operate on 115 V or 230 V AC power supply. The transmitter can be furnished with an optional heater (for ambient temperature below 0°F) and air purge connection. RS-485 port is optional.

Dual Range Sensitivity. A key feature for the Model 86 PID is its dual range sensitivity by which the unit can be set to accommodate a broad selection of products on one range and simultaneously provide high sensitivity required for detecting difficult gasoline-to-gasoline interfaces. In the first situation of Figure 3, the zero and span were selected to cover gasoline-to-kerosene interfaces and the second situation represents a high sensitivity range to detect gasoline-to-gasoline interfaces or products with similar or identical API gravities. A separate isolated 4 to 20 mA output is provided for each range.

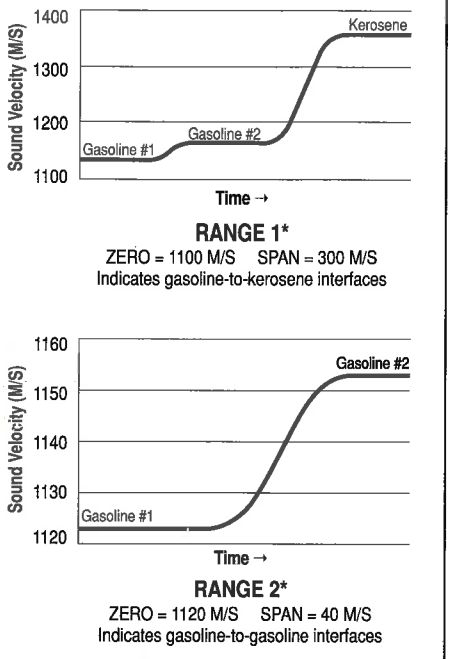


Figure 3 – GASOLINE INTERFACES

In Figure 4, the sensitivity of the Model 86 PID is best demonstrated by a comparison to interface detection via densitometry. As shown in the graph, the sound velocity of propane is 750 m/sec at a density of 0.5 SGU; for kerosene it is 1350 m/sec at 0.83 SGU. The respective spans are 600 m/sec vs. 0.33 SGU. The compensated repeatability of the Model 86 PID is 0.25 m/sec. This is equivalent to 1 part in 2400, or in terms of density, 0.33/2400 = 0.00014 SGU. A typical densitometer specification is 1% of full scale.

Maintenance. The Model 86 PID has no moving parts and is a low maintenance system. The transmitter has self diagnosing electronics and displays alarm conditions. All set up operations are menu driven from the LCD display and entered by the keypad.

Alarms. The Model 86 PID provides high and low alarms that are controlled by keypad entry. There is also a fault alarm to indicate when a problem arises. A Form-C relay is activated by each alarm. The alarm status may be viewed directly on the display or remotely via the RS-232 communication port.

Keypad. All instrument setup and display selection is accomplished via keypad. Step keys allow the user to scroll in either direction through any menu. Refer to Figure 5 for convenient menu guides for setup and calibration.

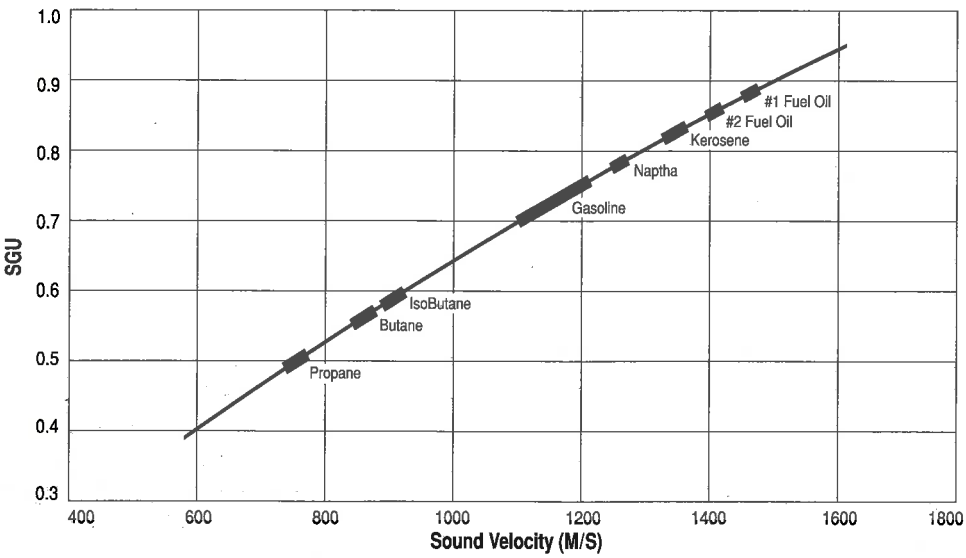


Figure 4 – INTERFACE DETECTION VIA DENSITOMETRY

Figure 5 – MODEL 86 PID KEYPAD

Convenient Menu Guides for Setup and Calibration

HELP Offers instruction in use of keypad and a description of each menu.

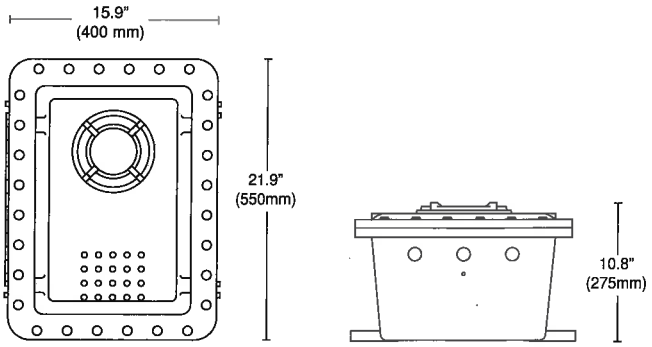
DISPLAY Changes LCD display. Selections include output as weight percent, density (grams/liter) or other, user-defined units; sound velocity; temperature; pressure; attenuation (a diagnostic aid).

SETUP Defines start-up values; zero; span; output units for each range; temperature, pressure, and averaging interval.

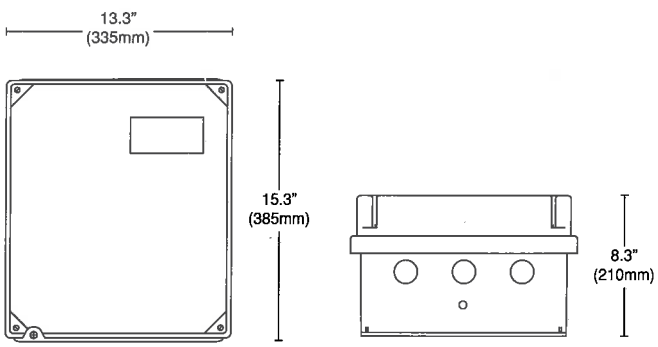
PARAM Sets value of linearization program coefficients. Contains "recipes" for 18 applications.

CAL Enables entry of a variety of calibration constants including fixed path length, temperature and pressure range scaling to match transducer ranges, and response delay correction.

ALARM Sets high and low alarm values; displays alarm conditions for overrange, underrange, high attenuation and out-of-lock conditions.



NEMA 7 ENCLOSURE



NEMA 4X ENCLOSURE

SPECIFICATIONS

POWER REQUIREMENTS:

	115 (±10%) volts ac 230 (±10%) volts ac
Frequency	50 to 60 hertz

TRANSMITTER POWER CONSUMPTION:

Standard	35 watts
With Heater	200 watts @ 115 VAC 250 watts @ 230 VAC

OUTPUT SIGNALS:

Interface	4-20mA (isolated) into 600 ohms maximum
Fault Indication	Form-C Relay
High/Low Setpoints	Form-C Relay
Data Link	RS-232, RS-485 optional

ENCLOSURE DIMENSIONS:

NEMA 4X	15.3"(h) x 13.3"(w) x 8.3"(d)
NEMA 7	21.9"(h) x 15.9"(w) x 10.8"(d)

WEIGHT:

NEMA 4X Enclosure	20 lbs. (9.1 kg)
NEMA 7 Enclosure	114 lbs. (51.7 kg)

OPERATING TEMPERATURE RANGE:

Standard Transmitter	0°C to +50°C (32° to 122°F)
With Heater	-40°C to +50°C (-40°F to 122°F)
Standard Transducer	-40°C to +150°C

PRODUCT MATERIAL:

Display	Liquid crystal (LCD) 2-line x 16 character
RS-232 Baud Rate	13 selectable, from 50 to 19,200

OPERATIONAL SPECIFICATIONS:

Pressure Range	0-1000 or 0-2000 PSIG
Compensation Range	-15°C to +85°C
Sound Velocity Range	500-1500 meters/second

NuSonics Division
SYSTEMS INTEGRATORS

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