

## Model 278 UGC Vibrating Densitometer

### Vibrating Densitometer for Pipeline and Process Measurement

#### Features and Benefits

- ▶ Continuous on-line density measurement
- ▶ No moving parts; accurate and reliable
- ▶ Provides input for mass flow calculations
- ▶ Small and compact
- ▶ Excellent repeatability and long-term stability
- ▶ Designed for use in Class I, Division 1, Groups C and D hazardous locations (model 278 CSA approved)
- ▶ Measurements made at operating conditions
- ▶ Easily installed and maintained
- ▶ Durable

#### Description

One of the many parameters that must be accurately measured for product quality control, custody transfer, process control, or liquid interface detection purposes is liquid density. For more than 25 years, the Chandler Densitometer has been used by major pipelines and other industries for reliable, rugged and accurate fluid metering (custody transfer), pipeline interface detection, and as a blending and process control tool. The frequency output of the Chandler Vibrating Densitometer is compatible with most flow computers (consult factory for details).

The Vibrating Densimeters are rugged and accurate and designed to meet the most demanding applications found in pipeline and process measurement. The vibrating element is manufactured

from Ni-Span C, a nickel-iron-chromium alloy with additions of aluminum and titanium, for excellent long-term stability under the most difficult conditions. For corrosive applications, other materials are available.

#### Operation

The Vibrating Densitometer is composed of two tubes and end pieces forming a mechanical resonant system. The tubes are maintained in oscillation at resonant frequency by an electronic amplifier that uses a piezoelectric driver and pickup elements in a feedback arrangement. The Densitometer is installed with scoops in such a manner that a sample of the fluid from the pipeline is diverted

through the two tubes — flowing up through the first tube and down through the second. The fluid, therefore, becomes a part of the vibrating elements, and the resonant frequency (and also period) will vary with the density of the fluid. The relationship between density and period of oscillation can be defined with the following second order equation:

$$Du = K0 + (K1 \times T) + (K2 \times T^2)$$

Where: Du = Density, in gr/cc, uncorrected for pressure or temperature; and T = Period (microseconds). K0, K1 and K2 are determined at calibration by measuring the period of oscillation with three liquids of known density and solving three simultaneous equations for the coefficients.

*The Chandler Densitometer has been used by major pipelines and other industries for more than 25 years.*



# Model 278 UGC Vibrating Densitometer

## Specifications

### Accuracy:

- ±.0002 gr/cc max. from .3 to .5 gr/cc;  
±.0125 from 18.7 to 31 lb/ft<sup>3</sup>
- ±.0004 gr/cc max. from .5 to 1.0 gr/cc;  
±.025 from 31 to 62 lb/ft<sup>3</sup>
- ±.0005 gr/cc max. from 1.0 to 1.6 gr/cc;  
±.031 from 62 to 100 lb/ft<sup>3</sup>

### Repeatability:

- ±.0001 gr/cc max. for .3 to 1.0 gr/cc density range;  
±.0062 from 18.7 to 62 lb/ft<sup>3</sup>
- ±.0002 max. for 1.0 to 1.6 gr/cc density range;  
±.0125 from 62 to 100 lb/ft<sup>3</sup>

### Calibrated Density Range:

3 - 1.0 gr/cc (300 to 1000 kg/m<sup>3</sup>)  
(18.7 to 62.43 lb/ft<sup>3</sup>)

*Optional:* To 1.6 gr/cc (1600 kg/m<sup>3</sup>)  
(100 lb/ft<sup>3</sup>)

### Temperature Range:

-40 to 85°C (-40 to 185°F)

### Process Connections:

3/4" FNPT. Specify pipeline size for optional scoops.

### Recommended Flow Rate:

Minimum 5.7 LPM (1.5 GPM)

### Maximum Working Pressure:

FP27800 (Ni-Span C), standard supply  
4000 psi (276 bar)  
FP27800SS (Stainless Steel)  
3200 psi (220 bar)  
FP27800HA (Hastelloy)  
3200 psi (220 bar)

**Power Requirements:** 15 to 36 VDC  
(24 VDC ± 8 VDC @ 35 mA)

### Output Signal:

The open collector output (referenced to power supply common) is capable of sinking up to one Amp of current (35 mA is nominal). Typical frequency range from 1 KHz - 2 KHz. Pull-up resistor is required when used with typical flow computers.

### Safety Approval:

Canadian Standards Association (CSA) approved for Class I, Div 1, Groups C&D

**Size:** 100mm round, 460mm long  
(4" x 18 1/8")

**Manifold:** Model 278: 203mm x 50mm x 50mm (8" x 2" x 2")

**Shipping Weight:** 25 lb (11 kg)

**Wetted Parts:** Ni-Span C Tubes; 304 stainless steel manifold; Viton O-rings.

**Standard Cover:** NEMA 4, alodine-coated and powder-coated aluminum.

## Options

- ▶ Stainless steel or Hastelloy C wetted parts for corrosive liquids
- ▶ Kalrez O-rings for corrosive liquids
- ▶ BUNA O-rings for liquid CO<sub>2</sub> applications
- ▶ NEMA 4X stainless steel cover
- ▶ Pipeline insertion scoops
- ▶ Insulating blanket
- ▶ Piping installation kits
- ▶ Cleaning tool

**AMETEK**  
PROCESS INSTRUMENTS

150 Freeport Road, Pittsburgh, PA 15238  
Ph. +1-412-828-9040, Fax +1-412-826-0399  
[www.ametekpi.com](http://www.ametekpi.com)



© 2011, by AMETEK, Inc.  
All rights reserved. Printed in the U.S.A.  
F-0167 Rev. 3 (0111)

One of a family of innovative process analyzer solutions from AMETEK Process Instruments.  
Specifications subject to change without notice.

### SALES AND MANUFACTURING:

**USA - Delaware**  
455 Corporate Blvd., Newark DE 19702 • Tel: +1-302-456-4400, Fax: +1-302-456-4444

**USA - Oklahoma**  
2001 N. Indianwood Ave., Broken Arrow OK 74012 • Tel: +1-918-250-7200, Fax: +1-918-459-0165

**CANADA - Alberta**  
2876 Sunridge Way N.E., Calgary, AB T1Y 7H9 • Tel: +1-403-235-8400, Fax: +1-403-248-3550

### WORLDWIDE SALES AND SERVICE LOCATIONS:

**USA - Texas**  
Tel: +1-713-466-4900, Fax: +1-713-849-1924

**CHINA**  
Beijing / Tel: 86 10 8526 2111, Fax: 86 10 8526 2141  
Chengdu / Tel: 86 28 8675 8111, Fax: 86 28 8675 8141  
Guangzhou / Tel: 86 20 8363 4768, Fax: 86 20 8363 3701  
Shanghai / Tel: 86 21 5868 5111, Fax: 86 21 5866 0969

**FRANCE**  
Tel: 33 1 30 68 89 20, Fax: 33 1 30 68 89 29

**GERMANY**  
Tel: 49 21 59 91 36 0, Fax: 49 21 59 91 3639

**INDIA**  
Tel: 91 80 6782 3200, Fax: 91 80 6782 3232

**SINGAPORE**  
Tel: 65 6484 2388, Fax: 65 6481 6588

CHANDLER ENGINEERING®