

# Solartron

## Gas density & specific gravity products

Data sheet  
B1253



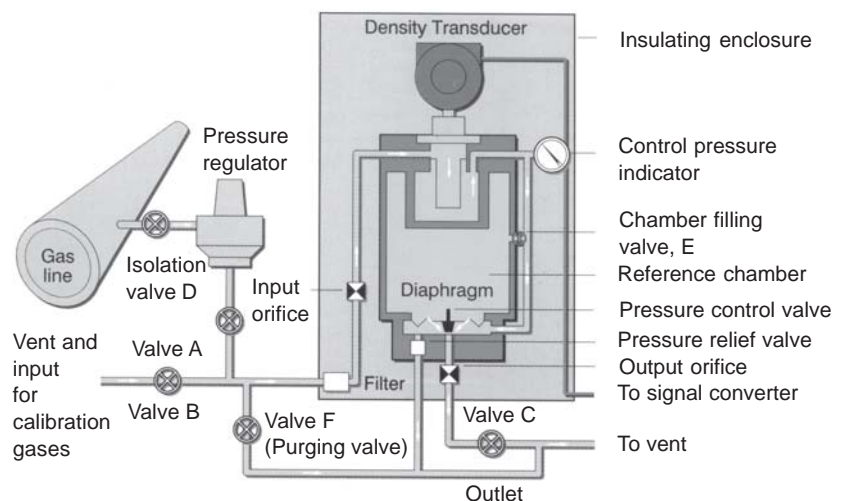
Solartron Mobrey is the market leader in the supply of precision measurement solutions for the power, oil, gas, aerospace and process industries.

Part of the Roxboro Group PLC, Solartron Mobrey manufactures a range of transducers and instrumentation for on-line continuous measurement of density and viscosity in liquids and gas. These products are renowned for their accuracy and reliability.

**Solartron Mobrey's 7812 and 3098 transducers bring you all the benefits of highly accurate, continuous on-line measurements of gas density and gas specific gravity:**

- ▶ Better control of product quality
- ▶ Faster response to changing conditions
- ▶ Reduced waste
- ▶ Improved safety
- ▶ Greater profitability
- ▶ Overcomes disadvantages of traditional sampling techniques

With over 35 years' experience in the design, manufacture and installation of transducers and flow computers, Solartron Mobrey is dedicated to bringing you the best possible measurement solutions available today.



## 3098 Gas Specific Gravity Transducer



The 3098 is the latest development in a product line well established as the industry standard for gas gravimeters. It is the only product that offers continuous on-line measurements as well as:

- ▶ Highest accuracy and resolution available today
- ▶ Fast, dynamic response to process conditions
- ▶ Self compensation for gas compressibility
- ▶ Custody transfer approval

The 3098 utilises a resonating element gas densitometer which is surrounded by a constant volume reference chamber, **V**, filled with a fixed quantity of gas. A diaphragm ensures that the pressure, **P**, of the sample gas in the densitometer is equal to that of the reference gas, and the whole system is temperature stabilised.

The specific gravity of a gas is the ratio of its molecular weight, **M**, to that of standard air. However, with equalised temperature, **T**, and pressure, with supercompressibility effects, **Z**, taken into account, the specific gravity and relative density are equivalent.

The density,  $\rho_s$  of the sample gas is measured by the densitometer.

By definition:

$$\rho_s = M_s \cdot P / V \cdot T \cdot Z_s$$

Similarly, the density of the reference gas is:

$$\rho_r = M_r \cdot P / V \cdot T \cdot Z_r$$

Since a fixed quantity of the reference gas is contained in a constant volume:

$$\rho_r / M_r = P / V \cdot T \cdot Z_r = K$$

Thus:

$$\rho_s = K \cdot M_s \cdot Z_r / Z_s$$

and if the reference gas is the same as the sample gas:

$$Z_r = Z_s \text{ and } \rho_s = K \cdot M_s$$

Thus the output of the densitometer is proportional to the molecular weight - and hence specific gravity - of the gas.

**Applications of the 3098 include:**

- ▶ Specific Gravity measurement,
- ▶ Calculation of calorific value using AGA 5
- ▶ Relative density measurement

3098 Specification	
Specific gravity range	0.1 to 3 (typical)
Process gas	Dry, clean, non-corrosive gases
Accuracy*	Up to +0.1% or reading
Repeatability*	+0.02% of reading
Temperature range	-30 to +50°C (-22 to +122°F) or as limited by the dewpoint of the gas
Temperature coefficient	0.01%/°C (0.005%/°F)
Reference pressure	1.2 to 7.0 bars (17 to 101psi) absolute @ 20°C (68°F)
Supply pressure	Min: reference pressure +15% Max: reference pressure +100%
Gas flow rate	0.2 to 60 normal cc/s (0.012 to 3.66in <sup>3</sup> /s)
Response time	<5s upon entry into enclosure
Calibration	Using gas samples with known S.G.
Mechanical features	
Gas connectors	Swagelock fitting for 6.35mm (0.25in)
Built-in filter	7 micron
Weight	10kg (22lbs) approx
Max. dimensions	500x500x300mm or 600x600x300mm (19.7x19.7x11.8in or 23.6 x 23.6 x 11.8in))
Electrical features	
Power supply	+15.5 to 33 Vdc, 20 to 30mA
Output signal	Frequency; 6V peak to peak for 3-wire system, 2 to 3V peak to peak for 2-wire system
Electrical connections	Outlet to suit M20 cable gland
Approval	
Safety	ATEX EEx ia IIC T5, CSA Class 1, Groups A, B, C & D
EMC	BS EN50081-2: 1994 BS EN50082-2: 1995

\* These figures apply to the measurement of a typical natural gas at a reference pressure of about 6 bars. Two gases of known specific gravity are required for calibration (typically nitrogen and methane). In practice, the accuracy achieved will depend on the care taken in calibration. An accuracy of 0.1% of reading can readily be obtained.

## 3098 Ordering information

Model	Description
3098	Gas specific gravity transducer
Code	Installation kit
E	ATEX insulating enclosure (500 x 500 x 300mm)
F	ATEX without enclosure <sup>1</sup>
G	ATEX insulating enclosure (600 x 800 x 300mm)
C	NEMA 4X insulating enclosure CSA Approval
D	Without enclosure <sup>1</sup> CSA Approval

<sup>1</sup> Please note that the 3098's published performance specification is with the instrument fitted inside an approved enclosure.

## 7812 Gas Density Transducer



The 7812 technology is unique in providing on-line continuous measurement. It offers:

- ▶ Highest accuracy and resolution available today
- ▶ Fast reaction to process changes
- ▶ Low maintenance requirement
- ▶ In-situ replacement of filters
- ▶ Approved for custody transfer

The 7812 is based on a resonating cylinder: the density of the gas flowing through the transducer changes the natural resonant frequency of the cylinder. By maintaining this vibration and measuring its frequency electronically, the density of the gas (which is directly related to mass flow) can be determined.

7812 Specification	
Density range	1-400kg/m <sup>3</sup> (0.06-25lb/ft <sup>3</sup> )
Limits of error (10 to 100% F.S.) for nitrogen	+0.1% of reading
for natural gas, ethylene	+0.15% of reading
Maximum operating pressure	150 bar, 2175 psi (Using weldolet kit) 250 bar, 3625 psi (using pocket kits)
Temperature range	-20 to +85°C (-4 to +185°F)
Temperature coefficient	0.001kg/m <sup>3</sup> /°C (0.00003lb/ft <sup>3</sup> /°F)
Process Gas	Must be dry and compatible with Ni-spanC902, Stainless Steel AISI 316, Stycast Catalyst 11 and Permendur Iron
Integral temperature measurement	PT100 class A
Temperature accuracy	Better than 0.5°C
Mechanical features	
Sample gas connection	¼" NPT (API) female
Integral filters	2 micron (inlet); 90 micron (outlet)
Weight	5kg (11lb)
Maximum dimensions	364 × 139mm (14½" × 5½")
Materials of construction	
Main housing	316L stainless steel
Liner	AMS 5643K
Cylinder	Ni-Span C
Amplifier housing	Die cast low copper alloy Polyurethane paint
Electrical features	
Power supply	+15.5V to 33VDC, 25mA
Output signal	1960 Hz + 10% at 0kg/m <sup>3</sup> (0lb/ft <sup>3</sup> ) 1580 Hz + 10% at 60kg/m <sup>3</sup> (3.8lb/ft <sup>3</sup> ) Nominal 6V pk to pk for 3 wire system Nominal 2-3V pk to pk across 330Ω resistor for 2 wire system
Approvals	
Safety	ATEX EEx ia IIC T5 CSA Class 1, Groups A, B, C & D
EMC	BS EN50081-2: 1994 BS EN50082-2: 1995

Applications of the 7812 include:

- ▶ Fiscal gas density measurement to ISO 5167 and AGA 3 standards
- ▶ Gas blending
- ▶ Direct measurement of ethylene density

## 7812 Ordering Information

Model	Description
7812	Gas Density Transducer
	<b>Code</b>   <b>Instrument types</b>
	1A   Range 1.5 - 10 kg/m <sup>3</sup> - Viton 'O' Rings
	1B   Range 1.5 - 10 kg/m <sup>3</sup> - EP 'O' Rings
	2A   Range 9 - 90 kg/m <sup>3</sup> - Viton 'O' Rings
	2B   Range 9 - 90 kg/m <sup>3</sup> - EP 'O' Rings
	3A   Range 25 - 250 kg/m <sup>3</sup> - Viton 'O' Rings
	3B   Range 25 - 250 kg/m <sup>3</sup> - EP 'O' Rings
	4A   Range 40 - 400 kg/m <sup>3</sup> - Viton 'O' Rings
	4B   Range 40 - 400 kg/m <sup>3</sup> - EP 'O' Rings
	<b>Code</b>   <b>Factory set</b>
	A   Factory set option
	<b>Code</b>   <b>Amplifier housing material</b>
	G   Aluminium Alloy
	<b>Code</b>   <b>Hazardous area certification</b>
	J   ATEX - EEx ia IIC T5 (-40°C to + 70°C)
	<b>Code</b>   <b>Calibration</b>
A   Standard Calibration	
B   UKAS Calibration 1.5 - 10 kg/m <sup>3</sup> Nitrogen	
C   UKAS Calibration 9 - 90 kg/m <sup>3</sup> Nitrogen	
D   UKAS Calibration 25 - 250 kg/m <sup>3</sup> Nitrogen	
E   UKAS Calibration 40 - 400 kg/m <sup>3</sup> Nitrogen	
<b>Code</b>   <b>Factory set</b>	
C   Factory set option	
<b>Code</b>   <b>Factory set</b>	
C   Factory set option	
<b>Code</b>   <b>Traceability</b>	
A   Standard - (Non-Traceable)	
X   Traceability	

NB: For correct installation of the 7812 gas density transducer, Solartron offer a number of installation kits. For further information, please contact your nearest Solartron Mobrey sales office.

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