Panametrics

Datasheet

TransPort® PT878GC

Panametrics portable gas ultrasonic flowmeter

The TransPort PT878GC clamp-on gas flowmeter is a complete ultrasonic flow metering system for measurement of most gases, including:

- Natural gas
- Compressed air
- Fuel gases
- Erosive gases
- Corrosive gases
- Toxic gases
- High-purity gases
- Air separation gases

PANA049DS Rev. 7

Portable flow metering at its best

The TransPort PT878GC flowmeter is a highly versatile, self-contained, portable transit-time system with options and accessories to meet a variety of gas flow measurement needs. Its compact size, lightweight, rechargeable battery pack, and universal power supply charger make it the ideal go anywhere flowmeter.

Historically, clamp-on flow metering was limited to liquids because existing methods could not work on metal pipes containing gases. Panametrics developed new technology that extends all the benefits of clamp-on flow metering to gas measurement. This remarkable ultrasonic technology works with gases at high or low pressure in pipes made of metal and most other materials.

The TransPort PT878GC flowmeter can be used to measure the flow of any gas. It is especially useful for metering erosive, corrosive, toxic, high-purity or sterile gases, or in any application where penetrating the pipe wall is undesirable. Since no tapping or cutting of the pipe is required, permanent installation costs are significantly reduced. The meter has no wetted or moving parts, causes no pressure drop and has very wide rangeability.

The new meter was tested extensively on metal pipes with diameters as small as 0.75 inches (20 mm) and as large as 24 inches (600 mm). This meter is suitable for measuring the flow of air, hydrogen, natural gas and many other gases.

No pressure drop, low maintenance

Because the transducers clamp onto the outside of the pipe, they do not obstruct the flow inside the pipe. This prevents the pressure drops typically caused by other types of flowmeters. The TransPort PT878GC has no components that will foul or collect debris, and there are no moving parts to wear out. As a result, it requires no lubrication and little or no routine maintenance.

Advanced clamp-on ultrasonic transducers

One of the biggest challenges in developing clamp-on ultrasonic transducers for gas applications is the difficulty in transmitting a coded ultrasonic signal through a metal pipe wall, through the gas, and then back through the pipe wall to the second transducer that is waiting to receive the signal. In gas systems, only 4.9 x10–7 percent of the transmitted sound energy is actually received by traditional ultrasonic transducers. This simply isn't enough to produce reliable measurements.

The new line of clamp-on gas transducers produces signals that are five to ten times more powerful than those of traditional ultrasonic transducers. The new transducers produce clean, coded signals with very minimal background noise. The result is that the TransPort PT878GC flowmeter system performs well even with low-density gas applications.

Features

- Clamp-on unobstructed installation
- No wetted parts
- No moving parts
- No pressure drop
- Sound speed output
- Standard volumetric flow calculation
- Small, lightweight and easy to use
- Large, backlit LCD display
- Rechargeable battery pack
- Logs over 100,000 flow data points
- Submersible package
- 32 site locations
- Optional thickness gauge

Quick and easy to use

It's possible to make the first flow measurement within minutes of opening the box—the TransPort PT878GC flowmeter is that easy to use. Input the site parameters, clamp the transducers onto the pipe, and adjust the spacing. No ancillary equipment is needed, and there's no need to break into the pipeline. An experienced user can make scores of different measurements in a single day. The TransPort PT878GC flowmeter is ideal for all kinds of flow survey work.

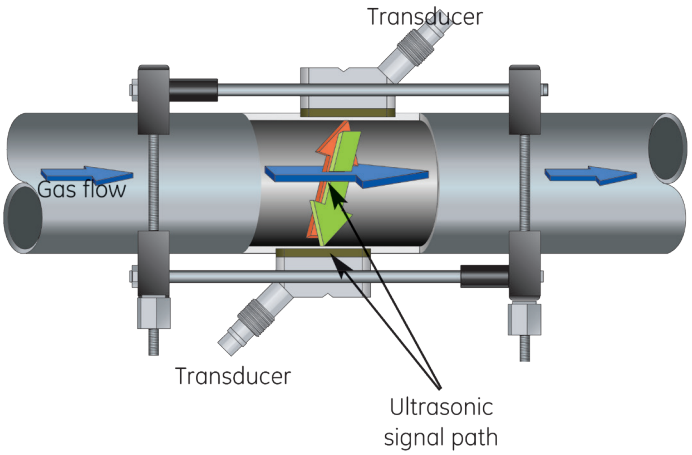
Built to be economical and stay economical

To be of real value, a portable flowmeter must be as economical to own and operate as it is capable in the field. The TransPort PT878GC flowmeter is built to stay in service for many years. Completely solid state, the device rarely wears out or needs servicing, resulting in little downtime and low maintenance costs.

Optional pipe wall thickness-gauge transducer

Pipe wall thickness is a critical parameter used by the TransPort PT878GC flowmeter for clamp-on flow measurements. The thickness-gauge option allows accurate wall thickness measurement from outside the pipe.

Optional pipe wall thickness gauge



Transit-time flow measurement technique

The TransPort PT878GC flowmeter uses the transit-time flow measurement technique

The transit-time technique uses a pair of transducers, with each transducer sending and receiving coded ultrasonic signals through the fluid. When the fluid is flowing, signal transit time in the downstream direction is shorter than in the upstream direction; the difference between these transit times is proportional to the flow of velocity. The TransPort PT878GC measures this time difference and uses programmed pipe parameters to determine flow rate and direction.

Alphanumeric and graphic liquid crystal display completes the picture

A large, multifunction LCD presents measured data in both alphanumeric and graphic forms. In addition, it helps make programming easy by presenting a software menu that walks you through data entry and function selection. Standard alphanumeric functions include flow velocity, volumetric or mass flow, and totalized flow in either English (U.S.) or metric units.

In graphic mode, the LCD shows both real time and logged data. The result is a chart recording right on the display, which is very useful for reviewing data and observing trends while on site.

PT878GC accessories

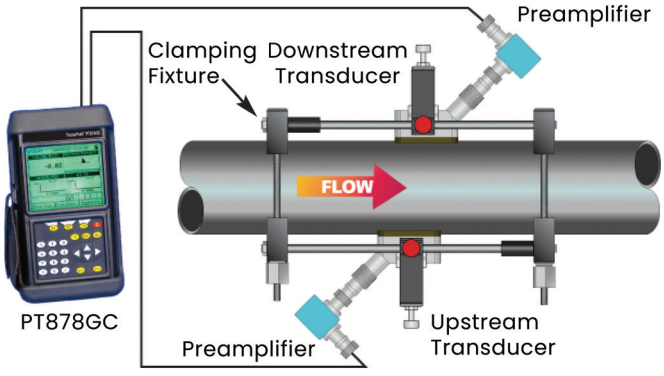
1. TransPort PT878GC
2. TransPort PT878GC AC charger
3. Clamp-on gas transducers
4. LEMO BNC transducer interconnection cable
5. Input/output cable
6. RS232 to infrared dongle
7. Thickness gauge
8. Printer
9. Printer AC charger
10. CFG-V1/V4/V8/V12 clamping fixtures
11. CFG-PI fixture with chain and alignment blocks 12
12. Preamplifiers
13. Alignment wrap
14. Couplant

Submersible, rugged electronics housing

This flowmeter is protected from the day-to-day rigors of industrial usage. The TransPort PT878GC is equipped with a rubber boot that provides protection against vibration and shock. The completely sealed housing and ports meet IP67 requirements, so the flowmeter will withstand submersion in up to 3 ft (1 m) of water for limited periods of time. It will continue to function safely even if it is dropped in water.

Wide range of clamping fixtures available

Transducer alignment is crucial in obtaining accurate measurements in clamp-on gas installations. Panametrics offers a wide range of clamping fixtures to help ensure proper alignment of transducers with minimal effort.



Typical meter setup for portable clamp-on gas flow

Technical **Specifications**

Operation and performance

Fluid types	Acoustically conductive gases with minimum pressure requirements. See installation requirements table.
Pipe size ranges	• 0.75 in to 12 in (20 mm to 300 mm) with TransPort PT878GC-01 electronics • 4 in to 24 in (100 mm to 610 mm) and larger with TransPort PT878GC-02 electronics
Pipe wall thickness	Thicker walled pipes require greater gas density. See Installation Requirements Table.
Pipe materials	All metals and plastics. No lined pipes.
Flow accuracy (velocity)	• For pipes 6 in (150 mm) and smaller: ±2% to 5% of reading typical • For pipes over 6 in (150 mm): ±1% to 2% of reading typical • Accuracy depends on pipe size and other factors.
Repeatability	±0.2% to 0.5% of reading
Range (bidirectional)	See Installation Requirements Table.
Rangeability (overall)	150:1 Specifications assume a fully developed flow profile (typically 20 diameters upstream and 10 diameters downstream of straight pipe run) and flow velocity greater than 5 ft/s (1.5 m/s). Pipes 2 inches (50 mm) or less require a minimum of 10 ft (3 m) of continuous straight run without flanges, welds or coupling joints.
Measurement parameters	Standard and actual volumetric flow, flow velocity and mass flow

Electronics

Flow measurement	Patented correlation Transit-Time™ model
Enclosure	Submersible IP67
Dimensions	Weight 3 lb (1.36 kg), size (h x w x d) 9.4 in x 5.5 in x 1.5 in (238 mm x 138 mm x 38 mm)
Display	240 x 200 pixel backlit LCD graphic display
Keypad	25-key, rubberized tactile membrane keypad
Internal battery	Rechargeable battery: 8 hours of continuous operation
Battery charger input	100 to 250 VAC, 50/60 Hz, 0.38 A
Memory	FLASH memory, field-upgradeable
Operating temperature	–4°F to 131°F (–20°C to 55°C)
Storage temperature	–40°F to 158°F (–40°C to 70°C) To ensure maximum battery life, storage temperature exceeding 95°F (35°C) is not recommended for more than one month.
Standard inputs/outputs	• One 0/4 to 20 mA current output • One user-selectable pulse (solid state, 5 V maximum) or frequency (5 V square wave, 100 to 10,000 Hz) • Two 4 to 20 mA analog inputs with switchable power supply for loop-powered temperature or pressure transmitter
Digital interface	Infrared communication port for printer or PC interface
Site-parameter programming	• Menu-driven operator interface using keypad and “soft” function keys • Online help functions including pipe tables • Storage for saving site parameters
Data logging	• Memory capacity to log over 100,000 flow data points • Keypad programmable for log units, update times, and start and stop time
Display functions	• Graphic display shows flow in numerical or graphic format • Displays logged data • Extensive diagnostic parameters
European compliance	Battery-powered system complies with EMC directive 89/336/EEC

Clamp-on ultrasonic flow transducers

Temperature ranges	• Standard: -40°F to 266°F (-40°C to 130°C) • Optional (overall range): -40°F to 446°F (-40°C to 230°C)
Transducer materials	Stainless steel and plastic
Mountings	Portable gas-transducer clamping fixtures in polycarbonate carrying cases: • PCFG-1 for pipes smaller than 12 in (300 mm) in diameter • PCFG-2 for pipes larger than 12 in (300 mm) in diameter
Mounting couplant	CPL-16
Area classifications	• Standard: general purpose • Optional: weatherproof Type 4 IP65 • Optional: explosion-proof Class I, Division 1, Groups C and D • Optional: flameproof Ex II 2 G EEx md IIC T6–T3 (certification pending) TransPort PT878GC electronics are designed for general purpose areas.

Transducer cables

- Standard: one pair of LEMO® coaxial transducer connectors with 25 ft (8 m) cables
- Optional: 500 ft (154 m) extension cables available for most transducers

Thickness-gauge option

Transducer	Panametrics dual-element transducer
Pipe-thickness range	0.05 in to 3 in (1.3 mm to 76.2 mm)
Pipe materials	Most standard metal and plastic pipe materials
Accuracy	±1% typical or ±0.002 in (±0.05 mm)
Thermal exposure	Continuous operation to 100°F (37°C); intermittent operation to 500°F (260°C) for 10 seconds followed by two minutes air cooling

Additional options

Printer	Infrared, portable, thermal printer with rechargeable battery and 120 to 240 VAC power supply/recharger Weight 13 oz (370 g), size 6.3 in x 6.5 in x 2.3 in (160 mm x 164.2 mm x 59 mm), print width 4 in (104 mm)
RS232-to-infrared	Infrared adapter plugs into any available serial port to give desktop PCs infrared capability

PT878GC installation requirements table

The following table shows the minimum pressure requirements of the TransPort PT878GC for given pipe sizes and wall thicknesses. Also provided is the maximum flow velocity of the meter for each case. Refer to the TransPort PT878GC installation and operation manuals for more detailed data.

Nominal pipe size in (mm)	Pipe wall thickness in (mm)	Minimum pressure psig (bar)		Maximum flow velocity ft/s (m/s)	
		Air	NG	Air	NG
3/4 (20)	≤0.07 (1.8)	60 (5.1)	-	90 (27.4)	-
1 (25)	≤0.14 (3.6)	60 (5.1)	-	90 (27.4)	-
1-1/2 (40)	≤0.15 (3.8)	60 (5.1)	-	90 (27.4)	-
2 (50)	≤0.16 (4.1)	60 (5.1)	200 (14.8)	90 (27.4)	110 (33.5)
3 (75)	≤0.22 (5.6)	60 (5.1)	200 (14.8)	120 (36.6)	120 (36.6)
4 (100) 4 (100) 4 (100)	≤0.24 (6.1) ≤0.34 (8.6) ≤0.68 (17.3)	60 (5.1) 180 (13.4) 300 (21.7)	150 (11.4) 400 (28.6) 800 (56.2)	120 (36.6) 120 (36.6) 72 (21.9)	120 (36.6) 120 (36.6) 72 (21.9)
6 (150) 6 (150) 6 (150)	≤0.28 (7.2) ≤0.44 (11.2) ≤0.87 (22.1)	60 (5.1) 180 (13.4) 300 (21.7)	150 (11.4) 400 (28.6) 800 (56.2)	90 (27.4) 90 (27.4) 55 (16.8)	120 (36.6) 120 (36.6) 72 (21.9)
8 (200) 8 (200) 8 (200)	≤0.33 (8.4) ≤0.5 (12.7) ≤0.88 (22.4)	60 (5.1) 180 (13.4) 300 (21.7)	175 (13.1) 400 (28.6) 800 (56.2)	80 (24.4) 80 (24.4) 80 (24.4)	100 (30.5) 100 (30.5) 100 (30.5)
10 (250) 10 (250) 10 (250)	≤0.37 (9.4) ≤0.5 (12.7) ≤1.0 (25.4)	60 (5.1) 180 (13.4) 300 (21.7)	200 (14.8) 500 (35.5) 800 (56.2)	70 (21.3) 70 (21.3) 70 (21.3)	85 (25.9) 85 (25.9) 85 (25.9)
12 (300) 12 (300) 12 (300)	≤0.38 (9.7) ≤0.5 (12.7) ≤1.0 (25.4)	60 (5.1) 180 (13.4) 300 (21.7)	250 (18.3) 500 (35.5) 800 (56.2)	55 (16.8) 55 (16.8) 55 (16.8)	70 (21.3) 70 (21.3) 70 (21.3)
14 (350) 14 (350)	≤0.38 (9.7) ≤0.5 (12.7)	90 (7.2) 270 (19.6)	300 (21.7) 800 (56.2)	50 (15.2) 50 (15.2)	60 (18.3) 60 (18.3)
16 (400) 16 (400)	≤0.38 (9.7) ≤0.5 (12.7)	90 (7.2) 270 (19.6)	300 (21.7) 800 (56.2)	40 (12.2) 40 (12.2)	54 (16.5) 54 (16.5)
18 (450) 18 (450)	≤0.38 (9.7) ≤0.5 (12.7)	90 (7.2) 270 (19.6)	300 (21.7) 800 (56.2)	35 (10.7) 35 (10.7)	50 (15.2) 50 (15.2)
20 (500) 20 (500)	≤0.38 (9.7) ≤0.5 (12.7)	90 (7.2) 270 (19.6)	300 (21.7) 800 (56.2)	35 (10.7) 35 (10.7)	43 (13.1) 43 (13.1)
24 (600) 24 (600)	≤0.38 (9.7) ≤0.5 (12.7)	90 (7.2) 270 (19.6)	300 (21.7) 800 (56.2)	30 (9.1) 30 (9.1)	36 (11.0) 36 (11.0)

How to use this table:

1. Find pipe size of your application.
2. Find pipe wall thickness of your application.
   - 2A. Determine if your application meets the minimum pressure requirements given pipe size and pipe wall thickness as determined by pipe wall thickness.
   - 2B. Determine maximum flow velocity capability.
3. Consult factory for natural gas with sulfur or high carbon dioxide content.
4. Consult factory for applications that are not listed above.

Configuration options

How to order the PT878GC-SYS

PT878GC-SYS — **BASE MODEL NUMBER**

CODE	FREQUENCY
1	500 KHz to 1 MHz
2	200KHz to 500KHz
0	no transmitter

CODE	POWER CORD
EU	230 VAC (Schuko CEE 7/7)
UK	230 VAC (BS 1363 A)
US	110/120 VAC (NEMA 5-15P)
CN	230 VAC (CN)
JP	100-120 VAC (JIS)
AUSNZ	230VA (AUSNZ)
0	no power cord

CODE	PRE-AMPLIFIERS
PRE	two preamplifiers (standard)

CODE	TRANSDUCERS
A	C-RS (1 MHz)(-40°C to 150°C)
B	C-RS (0.5 MHz)(-40°C to 150°C)
C	C-RV (0.5 MHz)(-40°C to 150°C)
D	C-RW (0.2 MHz)(-40°C to 150°C)
E	C-RS (1 MHz)(-40°C to 150°C), C-RS (0.5 MHz)(-40°C to 150°C)
F	C-RS (1 MHz)(-40°C to 150°C), C-RV (0.5 MHz)(-40°C to 150°C)
G	C-RS (0.5 MHz)(-40°C to 150°C), C-RW (0.2 MHz)(-40°C to 150°C)
H	C-RV, (0.5 MHz)(-40°C to 150°C), C-RW (0.2 MHz)(-40°C to 150°C)
I	C-RL (1 MHz HT)(-40°C to 230°C)
J	C-RL (0.5 MHz HT)(-40°C to 230°C)
K	C-RW (0.2 MHz HT)(-40°C to 180°C)
L	C-RL (1 MHz HT)(-40°C to 230°C) C-RL (0.5 MHz HT)(-40°C to 230°C)
M	C-RL (0.5 MHz HT)(-40°C to 230°C), C-RW (0.2 MHz HT)(-40°C to 180°C)
0	no transducers

CODE	FIXTURES
1	fixture (3/4" -12")
2	fixture (12"-24")
3	fixture (3/4" -12" & 12"-24")
0	no clamping fixture

CODE	DAMPING MATERIAL
DMP1	damping material (<150°F)
DMP4	damping material (<200°F)
0	no damping material

CODE	ACCESSORIES
0	no accessories
TG2	thickness gauge DM5E
AIO	AIO cable
BAT	spare battery
DMP1	extra DMP1 damping material
DMP4	extraDMP4 damping material
BATAA	battery case (AA battery required)
EXT100	100 ft extension cable
EXT25	25 ft extension cable
HC	PT878GC hardcase

PT878GC-SYS	—	1	—	EU	—	PRE	—	A	—	1	—	DMP1	—	0	EXAMPLE CONFIGURATION STRING

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