

## Features

The PMP 4000 Series provides a complete range of high level voltage output pressure transducers offering advanced levels of measurement accuracy, stability and flexibility from a standard production device.

- Accuracy to  $\pm 0.04\%$  full scale (FS) best straight line (BSL)
- Pressure ranges from 70 mbar to 700 bar
- Gauge, absolute and differential formats available
- Stability  $\pm 0.1\%$  per annum
- 4 x full scale over pressure

## Applications

GE manufactures precision pressure sensors with a capability to meet critical applications in industrial and research environments.

- Test equipment
- Research and development
- Environmental test
- Monitoring critical pressures
- General industrial

# PMP 4000 Series

## Druck Amplified Output Pressure Transducers

PMP 4000 Series is a Druck product. Druck has joined other GE high-technology sensing businesses under a new name—GE Sensing.



# GE Sensing

## PMP 4000 Series Concept

At the heart of the 4000 Series is an advanced, high stability pressure measurement element micromachined from single crystal silicon within GE's own processing facility. The silicon element is mounted within a high integrity glass-to-metal seal and is fully isolated from the pressure media by a Hastelloy isolation diaphragm, electron beam welded to the glass-to-metal seal.

Surface mount electronics condition the output from the silicon diaphragm, correct for thermally induced errors and configure the output to the required high level voltage. Advanced design features built into the electronic circuitry enable minimum sensor size with utmost reliability. The electronics incorporate power supply regulation, reverse polarity, over-voltage and short circuit protection, coupled with EMC protection components.

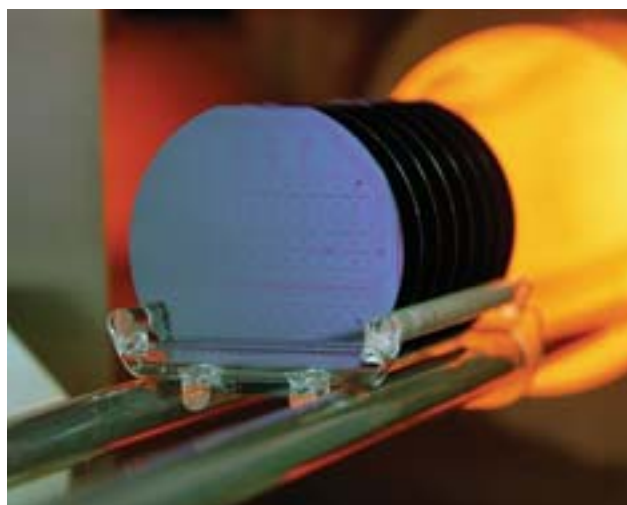
The fully encapsulated solid state design ensures integrity of product under high levels of shock and vibration, with an ingress protection rating up to IP68, dependent upon the electrical termination selected.

Every sensor is fully tested over both pressure and temperature ranges to demonstrate compliance to the specification. Prior to despatch, the sensor is adjusted to meet the particular pressure range and units, configured to the desired high level output voltage and completed with a range of electrical connections.

The demountable electrical connection formats allow the user to access the zero and span trim controls for system interchangeability and ease of re-calibration. A range of stainless steel pressure connections interface the sensor to the process media.

The PMP 4000 Series from GE is ideally suited to meet the demands of the industrial and automotive test cell market. Improved levels of performance measurement ( $\pm 0.04\%$ ), coupled with excellent stability, reduces the need for regular re-calibration periods, thus significantly reducing the cost of ownership.

With the benefit of the latest silicon measurement technology, the PMP 4000 Series can withstand the most demanding applications and still provide the performance of a precision pressure measurement device.



*Silicon wafers being loaded into an oxidation furnace.*



*Computerised testing and calibration of pressure transducers.*



*Automotive engine shown on a research and development test bed*

# PMP 4000 Series Specifications

## Pressure Measurement

### Operating Pressure Range

Any zero based range from

- 70 mbar to 65 bar gauge
- 65.1 to 700 bar sealed gauge
- 350 mbar to 700 bar absolute
- 70 mbar to 35 bar differential

*Compound ranges, e.g. -1 to 2 bar gauge, bi-directional differential ranges and other pressure units can be specified.*

### Static/Line Pressure (PMP 4100)

70 bar maximum

### Over Pressure

The rated pressure can be exceeded by the following multiples causing negligible calibration change:

Gauge and absolute reference:

- 10 x for ranges 70 to 350 mbar
- 6 x for ranges 350 to 700 mbar
- 4 x for ranges 700 mbar to 65 bar (140 bar maximum)
- 2 x for ranges 65.1 to 700 bar (1380 bar maximum)

Differential reference:

Positive side:

- 10 x for ranges 70 to 350 mbar
- 6 x for ranges 350 to 700 mbar
- 4 x for ranges 700 mbar to 35 bar (100 bar maximum)

Negative side:

Must not exceed positive side by greater than

- 6 x for ranges 70 to 350 mbar
- 4 x for ranges 350 to 700 mbar
- 2 x for ranges 700 mbar to 7 bar
- 10 bar for ranges 7 bar to 35 bar

### Containment

The rated pressure can be exceeded by the following multiples while containing the pressure media:

Gauge reference:

- 12 x for ranges 70 to 175 mbar
- 6 x for ranges 175 mbar to 65 bar (200 bar maximum)

Absolute and Sealed Gauge reference:

- 200 bar for ranges up to 65 bar
- 1380 bar for ranges 65.1 bar and above

Differential reference:

Positive port:

- 12 x for ranges up to 350 mbar
- 8 x for ranges up to 700 mbar
- 6 x for ranges up to 35 bar (200 bar maximum)

Negative port:

- 8 x for ranges up to 350 mbar
- 6 x for ranges up to 700 mbar
- 4 x for ranges up to 35 bar (15 bar maximum)

### Excitation Voltage

- 9 to 32 Vdc
- 15 to 32 Vdc for all ranges and spans below 700 mbar
- 15 to 32 Vdc for 10 Vdc output

### Output Voltage

- 70 mbar 0 to 2 Vdc (maximum)
- 175 mbar 0 to 4 Vdc (maximum)
- 350 mbar and above

Standard Output 0 to 5 V

Alternate Output, e.g. 1 to 5 Vdc

0 to 10 V, -5 to +5 V can be specified

- Compound and bi-directional outputs are available
- 4 wire outputs are available

Note: maximum offset at zero pressure cannot exceed +2.5 Vdc.

For non-standard output, please check with your local sales office before ordering.

### Output Impedance

<20  $\Omega$

### Load Impedance

Greater than 10 k $\Omega$  for quoted performance.

### R-Cal Facility/Shunt Calibration (Option C)

Connecting an external link between the appropriate terminals results in a positive shift of 80% FSO. Other values are available—refer to GE Sensing.

## Performance

### Accuracy

#### Combined Non-linearity, Hysteresis and Repeatability

- Standard:  $\pm 0.08\%$  FS BSL
- Option A:  $\pm 0.04\%$  FS BSL ranges above 175 mbar except  $\pm 0.06\%$  FS BSL for 5 bar range.

### Zero and Span adjustment

$\pm 5\%$  site adjustable by sealed, noninteracting potentiometers. (Demountable electrical connections only.)

# GE Sensing

## Temperature Effects

- Standard:  $\pm 1\%$  FS TEB over 0 to 50 °C  
 $\pm 2\%$  FS TEB over -20 to 80 °C
- Option B:  $\pm 0.5\%$  FS TEB over 0 to 50 °C  
 $\pm 1\%$  FS TEB over -20 to 80 °C

For ranges below 350 mbar these values increase pro rata.

## Acceleration Sensitivity

Typically 0.02% FS/g for 350 mbar decreasing to 0.0003% FS/g for ranges above 60 bar, along the sensitive axis.

## Mechanical Shock

1000g, 1ms half sine pulse in each of 3 mutually perpendicular axes will not affect performance.

## Vibration

Response less than 0.05% FS/g at 30g peak 10Hz-2kHz, limited by 12 mm double amplitude. (MIL-STD 810C Proc 514.2-2Curve L)

## Physical

### Operating Temperature Range

-20 to 80 °C.

### Positive Pressure Media

Fluids compatible with stainless steel 316L and Hastelloy C276

### Negative pressure media (PMP 4100)

Fluids compatible with stainless steel 316L, silicon, pyrex and adhesive

### Weight

- 120 g nominal 70 mbar to 65 bar ranges
- 170 g nominal 65.1 bar to 700 bar ranges
- 200 g nominal for differential ranges.

## CE marking

CE marked for electromagnetic compatibility and the pressure equipment directive

## Pressure Connection

- G 1/4 female
- G 1/4 B (Flat end)
- G 1/4 B (60° Int. cone)
- G 1/8 B (60° Int. cone)
- 1/4 NPT
- 7/16 UNF
- M12 X 1.5
- M14 X 1.5
- Depth Cone
- Other pressure connections available
- For pressure ranges above 65.1 bar alternative pressure connections are via adaptors (refer to GE Sensing for details).

## Electrical Connection

A range of cable and connector versions are available. Some electrical options are demountable to allow access to zero and span potentiometers. See installation drawings and ordering information for details.

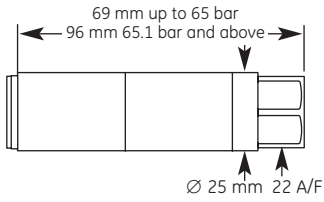
## Calibration Standards

Instruments manufactured by GE are calibrated against precision pressure calibration equipment which is traceable to National Standards.

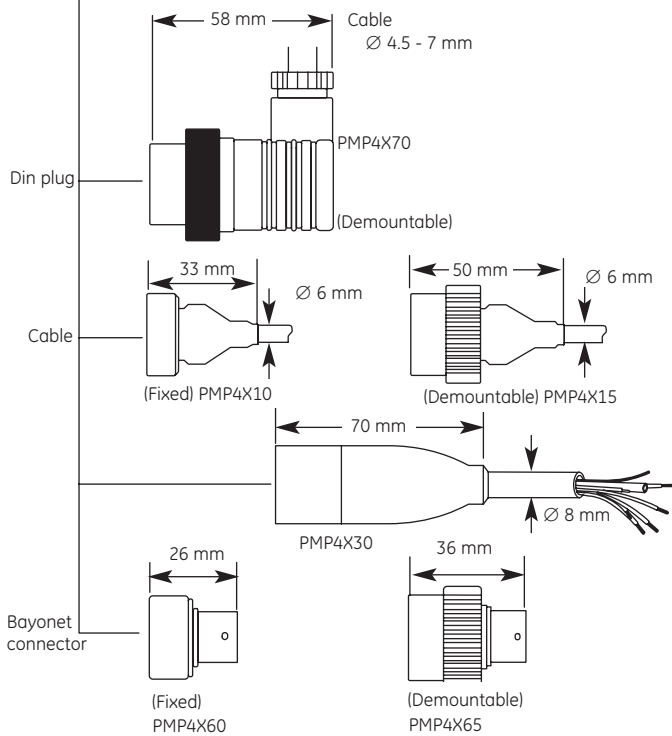
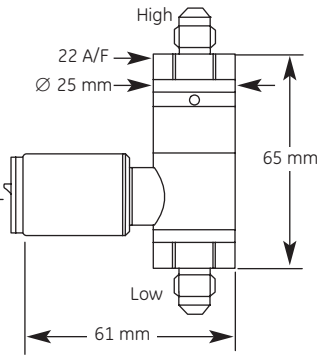
## Options

- (A) Improved accuracy  $\pm 0.04\%$  FS BSL,  $\pm 0.06\%$  FS BSL for 5 bar ranges
- (B) Improved temperature effects
- (C) "R" Cal/shunt facility
- (D) Mating connectors for PMP4X6X variants

**Gauge and absolute core**



**Differential core**



**Wiring detail**

UK Build

Part No.	supply		If specified output		RCAL*1	Case
	+ve	-ve	+ve	-ve		
PMP4X00	1	2	3	2	6	n/a
PMP4X10	red	white	yellow	blue	orange	n/a
PMP4X15	red	white	yellow	blue	orange	black
PMP4X30	red	white	yellow	blue	orange	black
PMP4X60	A	D	B	C	E	n/a
PMP4X65	A	D	B	C	E	F
PMP4X70	1	2	3	n/a	n/a	earth

**Ordering Information**

Please state the following:

**1) Select model number**

Code	Base model number
PMP4	Base model
	<b>Code Pressure Reference</b>
	0 Gauge, Absolute or Sealed Gauge
	1 Differential
	<b>Code Electrical Connector</b>
	00 Core
	10 Fixed cable
	15 Demountable cable
	30 Fixed submersible cable
	60 Fixed 6 pin bayonet
	65 Demountable 6 pin bayonet
	70 Demountable DIN plug/socket
	<b>Code Options</b>
	O None
	A Improved accuracy
	B Improved temperature effects
	C Rcal/shunt facility
	D Mating bayonet connector (for 4X6X)

- 2) State pressure range and units
- 3) State pressure reference (Gauge, Absolute, Sealed Gauge)
- 4) Output voltage at lowest pressure (check output voltage rules)
- 5) Output voltage at highest pressure (check output voltage rules)
- 6) Non standard Pressure connection



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