

# | P1A

Pressure Sensor

## Description

P1A family features a highly modular compact geometry. This modularity and extensive range of options offered by the P1A family make the advantages of Ceramic Capacitive technology in low-pressure sensing now available to the broadest spectrum of industrial applications. Besides the multiple standard configurations available, customized adaptations can also be considered.

Kavlico's P1A Ceramic Capacitive Pressure Sensor incorporates the latest generation sensing elements with state-of-the-art ASICs. Designed to withstand harsh environments, it features superior EMI protection, outstanding shock and vibration performance, impressive longevity and lifetime performance and high quality. It is tested to parameters that match or exceed those of competing products on the market.



## Features

- Small Compact Size
- Highly Modular Product Configurations
- Kavlico Ceramic Capacitive Technology
- Outstanding Long Term Stability and Performance
- Vacuum to 16 Bar Gage and Absolute
- Media Resistant CCAP Technology

## Applications

- Vacuum Machinery / Plant
- Medical and Laboratory Sterilizers / Autoclaves
- HVAC Systems
- Water Pump Booster Sets
- Pneumatic Systems
- Waste and Water Management
- Industrial OEM Applications

## MAIN FEATURES

|                              |                                                                                                                   |
|------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Pressure Ranges</b>       | 0 to 0.25 up to 0 to 16 bar (gage)<br>0 to 1.6 up to 0 to 16 bar (absolute)<br>-1 to 0 up to -1 to 0 bar (gage) * |
| <b>Electrical Connection</b> | Packard Electric Metri-Pack 150 Series *                                                                          |
| <b>Pressure Connection</b>   | G1/4A DIN 3852-E, 1/4 - 1/8 NPTF *                                                                                |
| <b>Housing Material</b>      | 304 Stainless Steel (1.4301)                                                                                      |
| <b>Connector Material</b>    | PBT (30% Glass Fibre)                                                                                             |
| <b>Output Signal</b>         | 4 - 20 mA, 0.5 - 4.5 VDC, 0 - 5 VDC, 0 - 10 VDC                                                                   |



## Pressure Ranges

|                              |                |      |     |     |    |     |     |    |    |    |    |
|------------------------------|----------------|------|-----|-----|----|-----|-----|----|----|----|----|
| <b>from 0 to...</b>          | bar (gage)     | 0.25 | 0.4 | 0.6 | 1  | 1.6 | 2.5 | 4  | 6  | 10 | 16 |
| <b>from 0 to...</b>          | bar (absolute) |      |     |     |    | 1.6 | 2.5 | 4  | 6  | 10 | 16 |
| <b>Proof Pressure Factor</b> |                | 4x   | 4x  | 4x  | 4x | 4x  | 4x  | 3x | 3x | 3x | 2x |
| <b>Burst Pressure Factor</b> |                | 6x   | 6x  | 6x  | 6x | 6x  | 6x  | 5x | 5x | 4x | 3x |

|                       |            |         |         |  |  |  |  |  |  |  |  |
|-----------------------|------------|---------|---------|--|--|--|--|--|--|--|--|
| <b>from -1 to...</b>  | bar (gage) | 0       | 1       |  |  |  |  |  |  |  |  |
| <b>Proof Pressure</b> | bar (gage) | -1 / +4 | -1 / +4 |  |  |  |  |  |  |  |  |
| <b>Burst Pressure</b> | bar (gage) | 6       | 6       |  |  |  |  |  |  |  |  |

|                              |                |    |    |    |    |    |    |    |     |     |     |
|------------------------------|----------------|----|----|----|----|----|----|----|-----|-----|-----|
| <b>from 0 to...</b>          | PSI (gage)     | 5  | 10 | 15 | 20 | 30 | 50 | 75 | 100 | 150 | 200 |
| <b>from 0 to...</b>          | PSI (absolute) |    |    |    | 20 | 30 | 50 | 75 | 100 | 150 | 200 |
| <b>Proof Pressure Factor</b> |                | 4x | 4x | 4x | 4x | 4x | 4x | 3x | 3x  | 3x  | 2x  |
| <b>Proof Pressure Factor</b> |                | 6x | 6x | 6x | 6x | 6x | 6x | 5x | 5x  | 4x  | 3x  |

## Physical

|                                  |                                                                                                                                        |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Life Cycle</b>      | min. 10 million full pressure cycles over the full range                                                                               |
| <b>Vibration Resistance</b>      | IEC 60068-2-64 (RANDOM) 20 PSD                                                                                                         |
| <b>Shock Resistance</b>          | 100 g minimum according to DIN EN 60068-2-27                                                                                           |
| <b>Drop Test</b>                 | 1 meter drop on concrete as per SAE J1455 / DIN EN 60068-2-3-1                                                                         |
| <b>Weight</b>                    | ≤ 50 grams                                                                                                                             |
| <b>Ingress Protection</b>        | IP 65 or IP67 - depending on electrical connector                                                                                      |
| <b>Medium Temperature</b>        | -30°C to + 120°C (others on request)                                                                                                   |
| <b>Environmental Temperature</b> | -30°C to + 100°C (depending on internal and external seal ring capability) <sup>1</sup>                                                |
| <b>Storage Temperature</b>       | -30°C to + 100°C (depending on internal and external seal ring capability) <sup>1</sup>                                                |
| <b>Media</b>                     | All class II fluids and gases compatible with stainless steel 304 (1.4301) and the internal and external (optional) seal ring material |

## Performance

|                                  |                                                                 |
|----------------------------------|-----------------------------------------------------------------|
| <b>Accuracy<sup>2</sup></b>      | ≤ 1 % of span <sup>4</sup>                                      |
| <b>Non-linearity<sup>3</sup></b> | 0.2 % of span <sup>4</sup>                                      |
| <b>Non-repeatability</b>         | 0.1 % of span <sup>4</sup>                                      |
| <b>1-year stability</b>          | 0.2 % of span <sup>4</sup>                                      |
| <b>Temp. Coefficients - Zero</b> | 0.2 % of span / 10 K within temperature range 0°C to + 80°C.2 % |
| <b>Temp. Coefficients - Span</b> | 0.2 % of span / 10 K within temperature range 0°C to + 80°C.2 % |

## Electrical

|                                    |                                                                                   |                              |                            |                            |
|------------------------------------|-----------------------------------------------------------------------------------|------------------------------|----------------------------|----------------------------|
| <b>Output Signal</b>               | 4...20 mA                                                                         | 0.5...4.5 VDC<br>ratiometric | 0...5 VDC                  | 0...10 VDC                 |
| <b>Operating Supply Signal</b>     | 9-30 VDC <sup>4</sup>                                                             | 5 VDC $\pm$ 5% <sup>4</sup>  | 8-30 VDC <sup>4</sup>      | 14-30 VDC <sup>4</sup>     |
| <b>Power Consumption</b>           | $\leq$ 600 mW                                                                     | $\leq$ 25 mW                 | $\leq$ 600 mW              | $\leq$ 600 mW              |
| <b>Overvoltage Protection</b>      | min. 33 VDC                                                                       | min. 33 VDC                  | min. 33 VDC                | min. 33 VDC                |
| <b>Short-circuit Proofness</b>     | not applicable                                                                    | Yes <sup>5</sup>             | Yes <sup>5</sup>           | Yes <sup>5</sup>           |
| <b>Insulation Voltage</b>          | 500 VDC                                                                           | 500 VDC                      | 500 VDC                    | 500 VDC                    |
| <b>Reverse Polarity Protection</b> | Yes <sup>6</sup>                                                                  | Yes <sup>6</sup>             | Yes <sup>6</sup>           | Yes <sup>6</sup>           |
| <b>Load</b>                        | $\leq (V_{sup}-8 \text{ VDC})/(0.02 \text{ A}) [\Omega]$                          | $\geq 4.7 \text{ k}\Omega$   | $\geq 4.7 \text{ k}\Omega$ | $\geq 4.7 \text{ k}\Omega$ |
| <b>Response Time</b>               | $\leq 5 \text{ ms max. to 63\% of full scale pressure with step change on input}$ |                              |                            |                            |

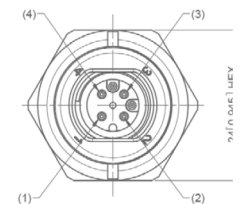
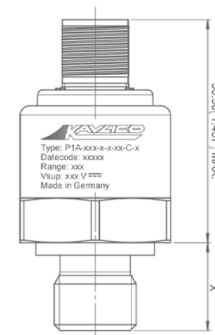


## DIMENSIONS

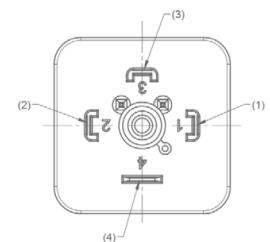
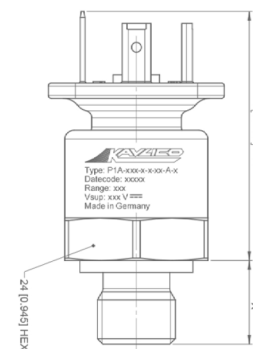
Dimensions in mm [Inch]

### Pressure Sensor with Electrical Connection

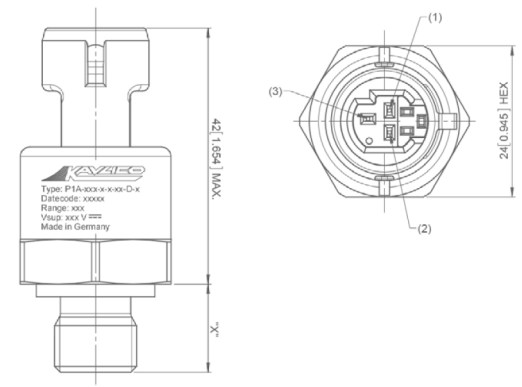
| M12 Pin Call Outs          |       |       |       |       |
|----------------------------|-------|-------|-------|-------|
| Output                     | Pin 1 | Pin 2 | Pin 3 | Pin 4 |
| 4-20 mA                    | Vsup  | ...   | Iout  | ...   |
| 0.5-4.5 VDC<br>ratiometric | Vsup  | ...   | Vout  | GND   |
| 0-5 VDC                    | Vsup  | ...   | Vout  | GND   |
| 0-10 VDC                   |       |       |       |       |



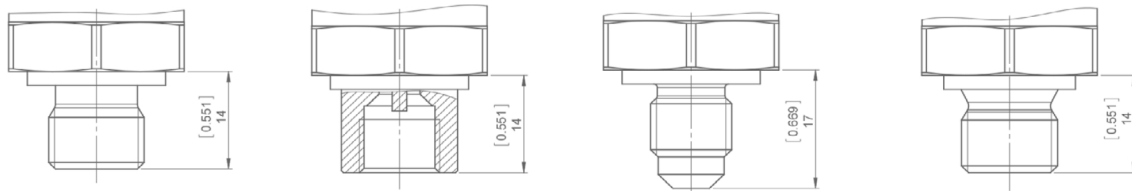
| 18 mm Pin Call Outs        |       |       |       |       |
|----------------------------|-------|-------|-------|-------|
| Output                     | Pin 1 | Pin 2 | Pin 3 | Pin 4 |
| 4-20 mA                    | Vsup  | Iout  | ...   | ...   |
| 0.5-4.5 VDC<br>ratiometric | Vsup  | Vout  | GND   | ...   |
| 0-5 VDC                    | Vsup  | Vout  | GND   | ...   |
| 0-10 VDC                   |       |       |       |       |



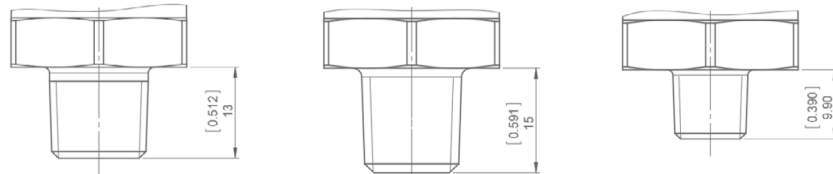
| Packard (metri-pack 150) Pin Call Outs |       |       |       |
|----------------------------------------|-------|-------|-------|
| Output                                 | Pin 1 | Pin 2 | Pin 3 |
| 4-20 mA                                | Iout  | Vsup  | ...   |
| 0.5-4.5 VDC<br>ratiometric             | GND   | Vsup  | Vout  |
| 0-5 VDC                                | GND   | Vsup  | Vout  |
| 0-10 VDC                               |       |       |       |



## Pressure Connections and Recommended Installation Torque



| Name   | G1/4A DIN 3852-E | 7/16-20 UNF-2B<br>SAE J1926-1 | 7/16-20 UNF-2A<br>SAE J1926-2 | G1/4A DIN 3852-A |
|--------|------------------|-------------------------------|-------------------------------|------------------|
| Thread | External         | Internal                      | External                      | External         |
| Torque | 20 Nm            | 20 Nm                         | 20 Nm                         | 20 Nm            |



| Name   | 1/4-19 BSPT<br>R1/4 PER DIN EN 10226 | 1/4-18 NPTF | 1/8-27 NPTF |
|--------|--------------------------------------|-------------|-------------|
| Thread | External                             | External    | Internal    |
| Torque | 20 Nm                                | 20 Nm       | 20 Nm       |

Note: Recommended torque may vary according to material and specific application



## GENERAL NOTES

\* for more options see How to Order

<sup>2</sup> Including non-linearity, hysteresis, non-repeatability, zero point and full scale error (corresponds to error of measurement per IEC 61298-2). Adjusted in vertical mounting position with pressure port down.

<sup>3</sup> BFSL according to IEC 61298-2 reference conditions to EN 61298-1

<sup>4</sup> Others on request

<sup>4</sup> Unit shall be supplied by a power supply with double/reinforced insulation (SELV) and limited energy in accordance to UL/EN/IEC 61010-1 or LPS in accordance to UL/EN/IEC 60950-1 or class 2 per UL1310/UL1585 (NEC or CEC). The power supply shall be approved for usage above 2000m if the pressure sensor is used in this environment.

For indoor and outdoor use, not exposed to direct sunlight.

<sup>5</sup> for min. 3 intervals at 5 minutes each

<sup>6</sup> for min. 10 seconds on assigned pins



## ORDERING OPTIONS

Example : P1A-06G-1-A-01-A-D

P1A Sensor, 0 - 2.5 bar Gage, 4 - 20 mA Output, No External Seal Ring, G1/4  
DIN 3852-E Pressure Connection, with 18mm, EN 175301-803-A003MS, 4 pole  
Electrical Connector and Fluorocarbon FKM Internal Seal Ring

|                                                                               |                                                       |           |          |          |          |           |          |          |
|-------------------------------------------------------------------------------|-------------------------------------------------------|-----------|----------|----------|----------|-----------|----------|----------|
| <b>Family</b>                                                                 | <b>P1A</b>                                            | <b>06</b> | <b>G</b> | <b>1</b> | <b>A</b> | <b>01</b> | <b>A</b> | <b>D</b> |
| <b>P1A</b>                                                                    |                                                       |           |          |          |          |           |          |          |
| <b>Pressure Ranges</b>                                                        |                                                       |           |          |          |          |           |          |          |
| <b>01</b> 0 - 0.25 Bar                                                        | <b>50</b> 0 - 5 PSI                                   |           |          |          |          |           |          |          |
| <b>02</b> 0 - 0.4 Bar                                                         | <b>51</b> 0 - 10 PSI                                  |           |          |          |          |           |          |          |
| <b>03</b> 0 - 0.6 Bar                                                         | <b>52</b> 0 - 15 PSI                                  |           |          |          |          |           |          |          |
| <b>04</b> 0 - 1 Bar                                                           | <b>53</b> 0 - 20 PSI                                  |           |          |          |          |           |          |          |
| <b>05</b> 0 - 1.6 Bar                                                         | <b>54</b> 0 - 30 PSI                                  |           |          |          |          |           |          |          |
| <b>06</b> 0 - 2.5 Bar                                                         | <b>55</b> 0 - 50 PSI                                  |           |          |          |          |           |          |          |
| <b>07</b> 0 - 4 Bar                                                           | <b>56</b> 0 - 75 PSI                                  |           |          |          |          |           |          |          |
| <b>08</b> 0 - 6 Bar                                                           | <b>57</b> 0 - 100 PSI                                 |           |          |          |          |           |          |          |
| <b>09</b> 0 - 10 Bar                                                          | <b>58</b> 0 - 150 PSI                                 |           |          |          |          |           |          |          |
| <b>10</b> 0 - 16 Bar                                                          | <b>59</b> 0 - 200 PSI                                 |           |          |          |          |           |          |          |
| <b>30</b> -1 - 0 Bar                                                          |                                                       |           |          |          |          |           |          |          |
| <b>31</b> -1 - 1 Bar                                                          |                                                       |           |          |          |          |           |          |          |
| <b>Reference</b>                                                              |                                                       |           |          |          |          |           |          |          |
| <b>A:</b> Absolute                                                            |                                                       |           |          |          |          |           |          |          |
| <b>G:</b> Gage                                                                |                                                       |           |          |          |          |           |          |          |
| <b>Output</b>                                                                 |                                                       |           |          |          |          |           |          |          |
| <b>1:</b> 4-20 mA                                                             |                                                       |           |          |          |          |           |          |          |
| <b>2:</b> 0.5-4.5 VDC radiometric                                             |                                                       |           |          |          |          |           |          |          |
| <b>3:</b> 0-5 VDC                                                             |                                                       |           |          |          |          |           |          |          |
| <b>4:</b> 0-10 VDC                                                            |                                                       |           |          |          |          |           |          |          |
| <b>External Seal Ring</b>                                                     |                                                       |           |          |          |          |           |          |          |
| <b>A:</b> None                                                                |                                                       |           |          |          |          |           |          |          |
| <b>B:</b> Fluorocarbon FKM (Viton)                                            |                                                       |           |          |          |          |           |          |          |
| Only for pressure connection port option 1 lower temperature limited to -20°C |                                                       |           |          |          |          |           |          |          |
| <b>C:</b> Aluminium Washer G1/4                                               |                                                       |           |          |          |          |           |          |          |
| Only for pressure connection port option 4                                    |                                                       |           |          |          |          |           |          |          |
| <b>D:</b> Copper Washer G1/4                                                  |                                                       |           |          |          |          |           |          |          |
| Only for pressure connection port option 4                                    |                                                       |           |          |          |          |           |          |          |
| <b>F:</b> Ethylene Propylene - EPDM                                           |                                                       |           |          |          |          |           |          |          |
| Only for pressure connection port option 1                                    |                                                       |           |          |          |          |           |          |          |
| <b>Pressure Connection (Port)</b>                                             |                                                       |           |          |          |          |           |          |          |
| <b>01:</b> G 1/4A DIN 3852-E                                                  | <b>05:</b> 1/4-19 BSPT                                |           |          |          |          |           |          |          |
| <b>02:</b> 7/16-20UNF-2B (female) SAE J1926-1 (modified)                      | Is equivalent to 1/4-19PT and R1/4 per DIN EN 10226 5 |           |          |          |          |           |          |          |
| With 45° cone and schrader                                                    | <b>06:</b> 1/4-18 NPTF                                |           |          |          |          |           |          |          |
| <b>03:</b> 7/16-20UNF-2A (male) SAE J1926-2 (modified)                        | <b>11:</b> 1/8-27 NPTF                                |           |          |          |          |           |          |          |
| With 45° cone                                                                 |                                                       |           |          |          |          |           |          |          |
| <b>04:</b> G1/4A DIN 3852-A                                                   |                                                       |           |          |          |          |           |          |          |
| <b>Built-In Electrical Connection</b>                                         |                                                       |           |          |          |          |           |          |          |
| <b>A:</b> 18mm, EN 175301-803-A003MS, 4 pole                                  | <b>D:</b> Packard Metri-Pack 150, 3 pole              |           |          |          |          |           |          |          |
| Sensor delivered without mating connector                                     | Sensor delivered without mating connector             |           |          |          |          |           |          |          |
| <b>C:</b> M12, 4 pole according to IEC 61076-2-101                            |                                                       |           |          |          |          |           |          |          |
| Sensor delivered without mating connector                                     |                                                       |           |          |          |          |           |          |          |
| <b>Internal Seal Ring</b>                                                     |                                                       |           |          |          |          |           |          |          |
| <b>C:</b> Neoprene - CR                                                       | <b>E:</b> Fluorosilicone - FVMQ                       |           |          |          |          |           |          |          |
| Operating Temp: - 30 to 120°C                                                 | Operating Temp: - 30 to 120°C                         |           |          |          |          |           |          |          |
| <b>D:</b> Fluorocarbon - FKM (VITON)                                          | <b>F:</b> Ethylene Propylene - EPDM                   |           |          |          |          |           |          |          |
| Operating Temp: - 20 to 120°C                                                 | Operating Temp: - 30 to 120°C                         |           |          |          |          |           |          |          |



Before installation and operation, ensure that the appropriate pressure sensor has been selected in terms of pressure range, design and specific measuring conditions. Non-compliance can result in serious injury and/or damage to the equipment.

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## AGENCY APPROVALS & CERTIFICATIONS



Pressure equipment directive 97/23/EC  
EMC directive 2004/108/EG,  
IEC 61326 Emission (Group 1, Class B) and Immunity (industrial locations)



2011/65/EU ROHS Directive



In Process

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