



PACE1000

Precision pressure indicator

A high precision Druck pressure indicator, designed for test bench, bench top and panel mount calibration, test and monitoring applications.

Features

- Single or multiple pressure range configurations
- Up to three pressures displayed simultaneously
- Utilises Druck's new unique range of piezo-resistive and Resonant Pressure Sensor technology
- Full scale pressure ranges up to 1000 bar (14500 psi/100 MPa)
- Choice of precision up to 0.001% FS
- Long term stability up to 0.001% FS
- Barometric reference option
- Airfield Task as standard with barometric option: Display QFE, QFF or QNH in pressure units or as altitude in feet or meters
- Negative gauge calibration included as standard
- Data Logging as standard with on screen replay
- Selectable numeric or graphic display
- High resolution touch screen operation
- Intuitive icon driven task menu structure
- Switch Test/Analogue Output option
- Switch Test/Voltage Free Contact option
- Aeronautical option
- Leak Test option
- RS232, IEEE connectivity, Ethernet and USB as standard
- Min/Max/Average display
- Compatible with software packages
- 28 selectable pressure units plus 4 user defined units
- Various service support options available

PACE precision pressure indicator

The new PACE precision pressure indicator brings together the latest measurement technology from Druck to offer an elegant, flexible and economical solution to pressure measurement for test, calibration and monitoring.

PACE employs digitally characterized pressure sensors which offer the quality, stability and precision associated with this latest generation of piezo-resistive and resonant devices.

PACE1000 offers a wide choice of standard pressure ranges, with three levels of precision to ensure that PACE1000 can accommodate specification and budget requirements.

The colour touch screen display of the PACE1000 can be configured by a user to indicate up to three pressure measurements from a possible five sensor inputs; three internal sensors and two external universal pressure modules.

The indication configuration extends to an ability to display in a numeric or graph format and also a differential of P1-P2 if more than two sensors are installed. The indicated display can be logged over a customized time period, sample rate and trigger. All the pressure sensor measurement can be retransmitted via one of the communication ports.

The Airfield task is supplied as standard with the Barometric option and enables the user to display QFE, QFF or QNH in pressure units or as altitude in feet or meters.

PACE 1000 options

Leak test

Leak Test measures leak rate over the measure dwell time. At the start of the test, the instrument measures the applied test pressure of the user system. The instrument records the pressure change during measure dwell time. On completion the display shows the leak rate results, with leak rate per second or per minute in the current pressure units selected.

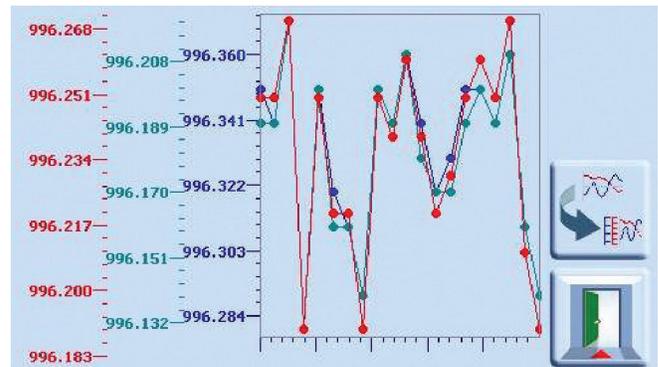
Switch test – standard with the analogue output or voltage free contacts option

Switch Test automates the testing of pressure switch devices. Following the test, displayed is the pressure at which contacts open and close and the switch hysteresis. Switch Test task can also be set to capture switch toggle max, min and average values.

Analogue output

The Analogue Output can be programmed via the setup menu screen to output a signal proportional to the instrument range selected. This allows the instrument to interface with PC or PLC I/O cards, remote displays, chart recorders or other data logging equipment.

Users can select outputs of 0 to 10 V, 0 to 5 V, -5 to 5 V and 0/4 to 20 mA. Precision with respect to host instrument measured pressure 0.05% FS over the host instrument operating temperature range, variable update rate to 80 readings per second. The option is programmable between minimum and FS pressure for proportional output against pressure.



Volt free contacts

Volt Free Contacts enable control of peripheral devices such as vacuum pumps, ovens, etc. Each VFC option has three independent volt-free NO/NC relay contacts. A number of conditions can be set within a PACE1000 instrument to trigger a relay toggling its contacts.

Aeronautical aviation

Available ranges: 55,000ft/650 knots or 75,000ft/1000 knots
Indication available in pure aeronautical units:

Altitude – feet or meters

Air speed – knots or km/hour, mph

Mach – mach number

Derived pressure at mean sea level and barograph for barometric applications.

Specifications

Pressure measurement	
IPS pressure ranges:	See section 5 on page 6 for full list of pressure ranges available
IRS pressure ranges:	See section 5 on page 6 for full list of pressure ranges available
IRS-B barometric reference ranges:	750-1150 mbar absolute, 10.9-16.7 psi absolute, 75-115 kPa absolute
Over range indication:	10% above mbar/bar full scale pressure range.
Pressure media:	Not suitable for use with Oxygen or combustible gas Pressure ranges 3.5 bar and above compatible with Stainless Steel 316 and Hastelloy C 276 Gauge ranges below 3.5 bar and absolute ranges below 3.5 bar abs: Dry, oil free, non-corrosive gas or air. For low pressure ranges below 350 mbar or 5 psi, please consult your sales representative
Display	
Panel	¼ VGA wide format 4.3 inch colour graphics LCD c/w integral touch screen
Comms update rate	8 times per second
Display update rate readout	2 times per second ± 9999999
Pressure units	mbar, bar, Pa(N/m ²), hPa, kPa, MPa, mmHg @ 0°C, cmHg @ 0°C, mHg @ 0°C, inHg @ 0°C, mmH ₂ O @ 4°C, cmH ₂ O @ 4°C, mH ₂ O @ 4°C, mmH ₂ O @ 20°C, cmH ₂ O @ 20°C, mH ₂ O @ 20°C, kg/m ² , kg/cm ² , torr, atm, psi, lb/ft ² , inH ₂ O @ 4°C, inH ₂ O @ 20°C, inH ₂ O @ 60°F, ftH ₂ O @ 4°C, ftH ₂ O @ 60°F, User Defined 1, User Defined 2, User Defined 3, User Defined 4 (Feet and Meters in Airfield task)
Performance over the calibrated temperature range	
IPS0 standard precision	0.02% Rdg + 0.02% FS (25 mbar: 0.20% Rdg + 0.20% FS, 70 mbar: 0.10% Rdg + 0.10% FS, 200 mbar: 0.04% Rdg + 0.04% FS) includes linearity, hysteresis, repeatability and temperature effects, assumes steady state temperature and regular zeroing (for absolute ranges an IRS-B needs to be installed)
IPS1 high precision	0.01% Rdg + 0.01% FS (25 mbar: 0.10% Rdg + 0.10% FS, 70 mbar: 0.05% Rdg + 0.05% FS, 200 mbar: 0.02% Rdg + 0.02% FS) includes linearity, hysteresis, repeatability and temperature effects, assumes steady state temperature and regular zeroing (for absolute ranges an IRS-B needs to be installed)
IPS2 premium precision	0.005% Rdg + 0.005% FS (25 mbar: 0.05% Rdg + 0.05% FS, 70 mbar: 0.025% Rdg + 0.025% FS, 200 mbar: 0.01% Rdg + 0.01% FS) includes linearity, hysteresis, repeatability and temperature effects, assumes steady state temperature and regular zeroing (for absolute ranges an IRS-B needs to be installed).
IPS long term stability	0.01% Rdg per annum 2 bar to 1,000 bar (30 psi to 14,500 psi). 0.02% Rdg, 1bar and 0.03% Rdg, 25 mbar - 700 mbar. Assumes regular zeroing (for absolute ranges an IRS-B needs to be installed).
Negative gauge precision	Maximum error at any given pressure value is equal to maximum error at the equivalent positive pressure value.
IRS0 standard precision	0.01% FS includes linearity, hysteresis, repeatability and temperature effects. For down ranged variants: 1300 mbar Precision = 0.0154% FS; 2600 mbar Precision = 0.0135% FS
IRS1 high precision	0.005% FS includes linearity, hysteresis, repeatability and temperature effects. For down ranged variants: 1300 mbar Precision = 0.0077% FS; 2600 mbar Precision = 0.0067% FS
IRS2 premium precision	0.0025% FS includes linearity, hysteresis, repeatability and temperature effects. For down ranged variants: 1300 mbar Precision = 0.0038% FS; 2600 mbar Precision = 0.0034% FS
IRS 3 Reference precision	2 and 3.5 bar absolute 0.0010% FS includes linearity, hysteresis, repeatability and temperature effects 8-211 bar absolute 0.0015% FS includes linearity, hysteresis, repeatability and temperature effects* For down ranged variants: 1300 mbar Precision = 0.0015% FS; 2600 mbar Precision = 0.0015% FS
IRS0-B standard precision barometric reference	Precision for the optional barometric reference 0.10 mbar or 0.001450 psi. Includes non-linearity, hysteresis, repeatability and temperature effects between 15°C (59°F) and 45°C (113°F).
IRS1-B high precision barometric reference	Precision for the optional barometric reference 0.05 mbar or 0.000725 psi. Includes non-linearity, hysteresis, repeatability and temperature effects between 15°C (59°F) and 45°C (113°F).
IRS2-B premium precision barometric reference	Precision for the optional barometric reference 0.025 mbar or 0.0003625 psi. Includes non-linearity, hysteresis, repeatability and temperature effects between 15°C (59°F) and 45°C (113°F)
IRS3-B reference precision barometric reference	Precision for the optional barometric reference 0.020 mbar or 0.0002901 psi. Includes non-linearity, hysteresis, repeatability and temperature effects between 15°C (59°F) and 45°C (113°F)
IRS long term stability	IRS0-IRS3 1300-3500 mbar absolute 0.0025% FS per annum, barometer 0.05 mBar/0.00072515 psi per annum IRS3 8-211 bar absolute 0.001% FS per 28 days*, barometer 0.05 mBar/0.00072515 psi per annum

IRS3 accuracy	<p>Absolute ranges 2000, 3500 mbar accuracy (2 Sigma) over calibrated temperature range 0.0004% RDG + 0.0027% FS. 1300 mbar 0.0007% RDG + 0.0041% FS 2600 mbar 0.0004% RDG + 0.0035% FS 8-101 bar 0.0011% RDG + 0.0026 % FS* 136 Bar 0.0025% RDG + 0.0023 % FS* 173 Bar 0.0026% RDG + 0.0022 % FS* 211 Bar 0.0027% RDG + 0.0022 % FS*</p> <p>Includes measurement precision, measurement long term stability (see below) and calibration equipment expanded uncertainty. Pseudo gauge range accuracy (3.5bara and below) will need to include the barometer uncertainty using the RSS (root sum of squares) method.</p>
Pseudo absolute mode precision	Gauge mode precision + barometric precision
Pseudo gauge mode precision	absolute mode reference precision + barometric precision

*To meet annual IRS3 accuracy specification, zeroing against a barometric reference is recommended every 28 days. The long term stability spec will be subject to the specification of the barometric reference used, quoted figures are for IRS3-B.

Pseudo gauge only option available. Note that atmospheric tare against the barometer and calibration via SCPI commands is not available in this mode. In this mode, Baro will be available for manual taring only.

Electrical

Power Supply	90 VAC to 130 VAC @ 47 to 63 Hz and 180 VAC to 260 VAC @ 47 to 63 Hz. 15 VA
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Communications

Communication	RS232, USB and IEEE-488, SCPI, DP1141, DP1142 and DP1150 emulation. LabVIEW drivers Ethernet (VXI-II and Sockets using SCPI).
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Data log	Display screen shot stored in CSV format, onto memory card or external USB storage device. User defined update rate from 1 second.
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Environmental

Temperature	Operating	10°C to 50°C (50°F to 122°F)
	Calibrated	15°C to 45°C (59°F to 113°F)
	Storage	-20°C to 70°C (-4°F to 158°F)

Sealing Humidity Vibration Shock Conformity	<p>IP20 (EN60529), indoor use only 5% RH to 95% RH non-condensing. Compliant with Def. Stan. 66-31 8.4 Cat 3 and MIL-T-28800E Cat 2 Mechanical shock conforms to EN61010 Electrical safety - Global (IEC61010-1, UL61010-1, CSA 22.2, No. 61010-1 and CB test certificate), LVD (EN 61010-1). EMC EN61326, PED, ROHS and WEEE. CE marked</p>
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Physical

Weight	3.2kg (excluding external PSU and packaging) to 6.5 lbs (including external PSU and packaging)
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Dimensions	218 mm wide x 88mm (2U) high x 250 mm deep (8.6in x 3.5 (2U) x 9.8 in)
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Pressure connection	G 1/8 Female (1/8 NPT Female by adaptor, standard for North America) 25 mbar to 210 bar. 9/16 18 UNF Autoclave male 350 bar to 1000 bar.
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Ordering information

Please state the following (where applicable)

1. Model PACE1000

PACE chassis	*PACE internal sensor – IRS absolute	*PACE internal sensor – IRS-B absolute	*PACE internal sensor – IPS gauge	*PACE internal sensor – IPS absolute	1 X Switch Test/ Voltage Free Contact option or Switch Test/ Analogue Output option	2 X Switch Test/ Voltage Free Contact option or Switch Test/ Analogue Output option	Leak Test and Aeronautical option	IRS3 Pseudo Gauge only
PACE1000 no internal sensor 3 X IDOS connection	○	○	○	○	•	•	•	○
PACE1001 1 X internal sensor 2 X IDOS connection	•	•	•	•	•	○	•	○
PACE1002 2 X internal sensors 2 X IDOS connection	•	•	•	•	• (not available if 1 IPS gauge is selected and no IRS-B)	○	•	•
PACE1003 3 X internal sensors 2 X IDOS connection	•	•	•	•	○	○	•	•

- Available
- Not Available

*Please state precision for each IPS/IRS selected.

2. Options

The range of optional features includes:

- Leak Test – Automatically measures leak rates in the desired units/minute or units/seconds
- Switch Test/Analogue Output – Accurate calibration of pressure switches/integration into older ATE applications
- Switch Test/Voltage Free Contacts – Accurate calibration of pressure switches/automatically triggering ancillary devices
- Aeronautical - Allows for the test and calibration of aeronautical instruments
Please state the required range:
55,000ft/650 knots or 75,000ft/1000 knots
- Pseudo gauge only option for IRS3

3. PACE chassis – Area of use/mains lead

Please state area of use for instrument set up:

- Europe
- North America
- Japan
- Asia
- Australia and New Zealand
- Rest of the world

Please state area of use for mains lead:

- UK
- Japan
- EU
- USA
- South Africa/India
- China
- Australia and New Zealand

4. IPS/IRS precision

- Standard precision – IPS0
- High precision – IPS1
- Premium precision – IPS2

- Standard precision – IRS0
- High precision – IRS1
- Premium precision – IRS2
- Reference precision – IRS3

- Standard precision – IRS0-B
- High precision – IRS1-B
- Premium precision – IRS2-B
- Reference precision – IRS3-B



PACE1000 from the rear

5. PACE Internal Pressure Sensor ranges – IPS

bar	psi	Pa
25 mbar g	0.35 psi g	2.5 kPa g
70 mbar g	1 psi g	7.0 kPa g
200 mbar g	3 psi g	20.0 kPa g
350 mbar g	5 psi g	35.0 kPa g
700 mbar g	10 psi g	70.0 kPa g
1 bar g	15 psi g	100.0 kPa g
2 bar g	30 psi g	200.0 kPa g
3.5 bar g	50 psi g	350.0 kPa g
7 bar g	100 psi g	700.0 kPa g
10 bar g	150 psi g	1.0 MPa g
20 bar g	300 psi g	2.0 MPa g
35 bar g	500 psi g	3.5 MPa g
70 bar g	1,000 psi g	7.0 MPa g
100 bar g	1,500 psi g	10.0 MPa g
135 bar g	2,000 psi g	13.5 MPa g
172 bar g	2,500 psi g	17.2 MPa g
210 bar g	3,000 psi g	21.0 MPa g
350 bar a	5000 psi a	35 MPa a
420 bar a	6000 psi a	42 MPa a
700 bar a	10000 psi a	70 MPa a
1000 bar a	14500 psi a	100 MPa a

All gauge versions available with negative calibration as standard.

For any range above 1 bar, pseudo absolute/gauge pressure range are available – select any range and add barometric option (excluding 1.3 and 2.6 bar).

PACE Internal Resonant Pressure Sensor ranges – IRS (+ denotes IRS3 only ranges)

mbar	psi	kPa
1.3 bara	0.5-19 psia	3.5-130 kPaa
2 bara	30 psia	200.0 kPaa
2.6 bara	0.5-38 psia	3.5-260 kPaa
3.5 bara	50 psia	350.0 kPaa
+8 bara	116 psia	0.8 MPaa
+11 bara	160 psia	1.1 MPaa
+21 bara	304 psia	2.1 MPaa
+36 bara	522 psia	3.6 MPaa
+71 bara	1,029 psia	7.1 MPaa
+101 bara	1,465 psia	10.1 MPaa
+136 bara	1,973 psia	13.6 MPaa
+173 bara	2,509 psia	17.3 MPaa
+211 bara	3,060 psia	21.1 MPaa

PACE barometric option*

PACE Internal Resonant Sensor Barometer ranges – IRS-B

mbar	psi	kPa
750-1150 mbar a	10.9 – 16.7 psi a	75-115 kPa a

*Provides absolute pressure option in addition to gauge pressure. In absolute mode adds barometric pressure to gauge pressure range. For absolute mode ranges below 1 bar please consult your sales representative.



External IDOS universal pressure module

6. Physical accessories

Please order the following as separate line items:

Part number	Description
IO-ADAPT-G1/4	Adaptor G1/8 Male to G 1/4 Female
IO-ADAPT-G18	Adaptor G1/8 Male to G1/8 Female
IO-ADAPT-1/8NPT	Adaptor G1/8 Male to 1/8 NPT Female
IO-ADAPT-1/4NPT	Adaptor G1/8 Male to 1/4 NPT Female
IO-ADAPT-7/16UNF	Adaptor G1/8 Male to 7/16 – 20 UNF Female
IO-ADAPT-AN4	Adaptor G 1/8 Male to AN4 37 Deg Male
IO-ADAPT-AN6	Adaptor G 1/8 Male to AN6 37 Deg Male
IO-ADAPT-BARB	Adaptor G 1/8 Male to 1/4 Hose
IO-ADAPTOR-KIT	Contains one of each of the above adaptors
IO-ADAPT-9/16AC	Adaptor 9/16 18 UNF Autoclave Female to 1/8 NPT Female
IO-SNUBBER-1	Snubber reference port
IO-DIFF-KIT-LP	Differential connection kit low pressure: Helps reduce the impact of thermal and/or pressure changes in ambient conditions occurring during the measurement cycle
IO-RMK-PI000	19" rack mount kit
IO-PAN-PI000	19" panel mount kit

7. Supporting services

Services ordering information:

Please order the following as separate line items:

Calibration

Part number	Description
UKAS	PACE1000 Accredited Pressure Calibration



PACE Family

PACE – pressure calibration and test solutions

PACE1000 – Precision Pressure Indicator

PACE1001 Barometer – Precision Barometric Indicator and Recorder

PACE5000 – Single Channel Pressure Controller Chassis

PACE6000 – Dual Channel Pressure Controller Chassis

CM0 – Standard precision high speed pressure controller module

CM1 – High precision high speed pressure controller module

CM2 – Premium precision high speed pressure controller Module

CM3 – Reference precision high speed pressure controller module

Related products

Druck manufacture a wide range of pressure transducers, transmitters, indicators, calibrators, controllers and Air Data test systems. Our range of portable calibrators also cover temperature and electrical parameters.

Please refer to www.bakerhughesds.com/druck/ pressurecontrollers for further information.

