

GE Sensing

Features

- Pressure ranges up to 10,000 psi (700 bar)
- Precision 0.025% of reading
- Precision barometric reference
- Internal or external sensors
- Split-screen LCD display
- Data storage, RS 232 and IEEE 488

Applications

GE Sensing is a world leading manufacturer of precision pressure instruments based upon its own piezoresistive and resonant silicon sensor technologies. The Druck DPI 145 combines these in a high precision pressure indicator which is very flexible and simple to operate. It is designed to address a wide range of applications in workshops and laboratories throughout industry.

DPI 145 Multifunction Pressure Indicator

DPI 145 is a Druck product. Druck has joined other GE high-technology sensing businesses under a new name—GE Industrial, Sensing.



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Innovation

Sophisticated measuring and processing technology is incorporated into one compact, functional instrument. Advanced software and a large, self-formatting "split-screen" display are among the many features which make the DPI 145 one of the most flexible indicators on the market. Simplified operation and proven electronics ensure highly reliable service.

Multiple measurements can be made simultaneously with a combination of up to six internal/external pressure sensor outputs being continuously monitored. Physically, special attention has been given to ensure suitability for bench use with a rotatable handle providing both a comfortable viewing angle during operation and a convenient carrying grip for portability.

Measuring

GE's ability to design and manufacture both sensor and instrument has resulted in a powerful combination of silicon sensors and digital compensation.

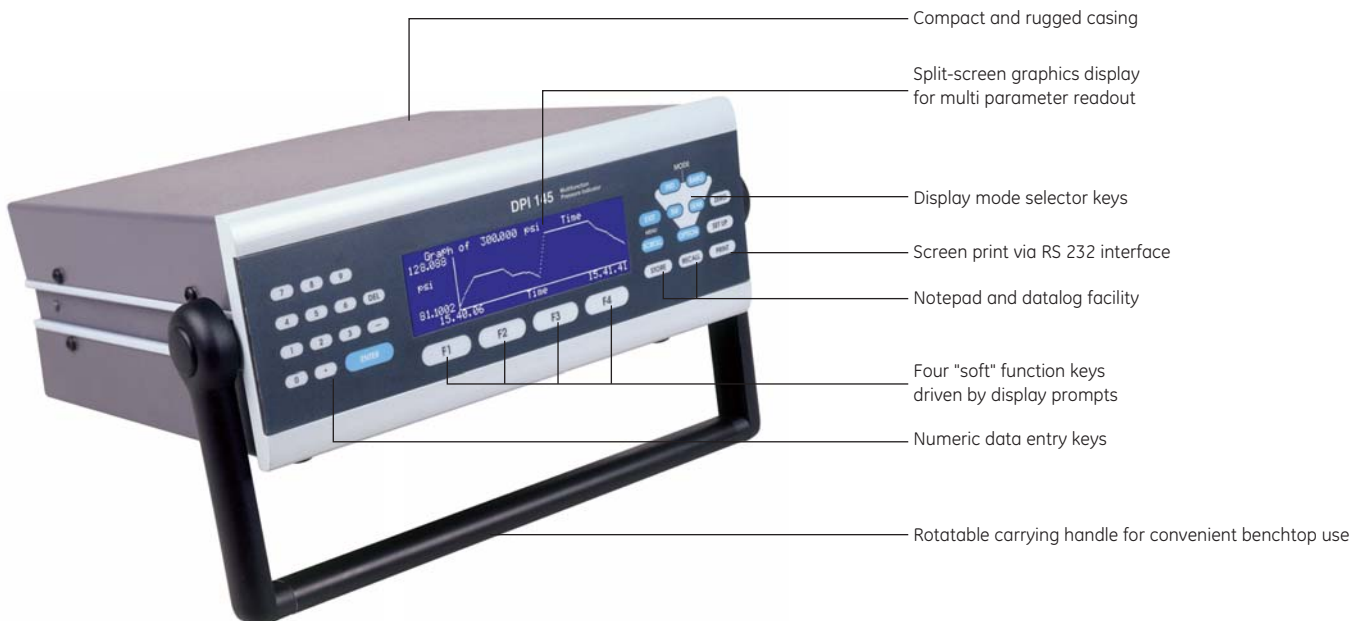
A wide range of pressures up to 10,000 psi (700 bar) can be measured from an extensive choice of sensors. For example, resonant silicon sensors provide high precision and exceptional long term stability for absolute pressure measurements up to 50 psi (3.5 bar). A sensor auto-selection feature enhances performance over the popular range of -14.5 to 300 psi (-1 to 20 bar) gauge using a matched "auto ranging" pair of piezoresistive sensors.

Absolute pressures can also be measured directly with piezoresistive sensors, or by combining gauge measurements with barometric pressure from a resonant sensor. This versatility enables cost and performance to be optimized.

Processing

Comprehensive functions are available on all channels:

- Multiple scaling
- Filtering, average and tare values
- Max/min value capture and alarms
- Flow (square root pressure value)
- Leak and pressure switch test
- Interchannel maths capability



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The display screen may be split to suit the required number of measurement or process variables up to a maximum of eight displays. Features associated with specific applications are grouped under single keys.

Quality

GE Sensing is ISO 9001 approved, with all instruments manufactured to strict quality control procedures and calibrated against traceable reference standards. Full UKAS certification is also available.

Simplicity

The DPI 145 is simple to operate, even to those unfamiliar with electronic pressure instrumentation. The intuitive menu-style software allows quick selection of the required function, ensuring that measurements and associated data processing can be achieved with ease and confidence.

Installation

The DPI 145 is designed for convenient bench top use. A rotating handle is fitted as standard, providing a comfortable viewing angle for the operator. An optional rack mounting kit provides a 5.25 in (134 mm) high (3U) x 19 in (483 mm) wide unit for standard rack installation.

Precision

The DPI 145 offers high precision. By utilizing Druck piezoresistive sensors, 0.025% of reading is standard for pressure measurements from 3 to 1000 psi (201 mbar to 70 bar) and 0.04% of reading for pressures up to 10,000 psi.

For gauge, differential and absolute pressures below 3 psi (201 mbar), the measurement precision is up to 0.05% of reading.

For barometric and low pressure absolute measurements, the DPI 145 can be supplied with Druck resonant pressure sensors. These are the aerospace industry standard, providing precision measurement of 0.013% full scale and long term stability of better than 0.01% per year.

By the use of digital characterization routines, the DPI 145 not only improves the basic precision of the sensors but also enhances temperature performance over 50°F to 86°F (10°C to 30°C).

Versatility

The DPI 145 multi-function indicator covers a wide range of gauge, absolute and differential pressure ranges from 0.4 in H₂O to 10,000 psi (1 mbar to 700 bar) full scale. For both pneumatic or hydraulic measurements, up to six sensors may be connected to the instrument simultaneously with a maximum of four internal and two external sensors.

The four internal channels enable two piezoresistive and two resonant pressure sensors to be connected. In addition, the instrument can store the characteristics of up to 10 external pressure sensors, with a maximum of one piezoresistive and one resonant silicon type to be used at any one time.

Split-Screen Display

The backlit LCD graphics display is bright and clear for easy viewing and automatically configures itself for single or split-screen readouts. The display splits and formats itself to the optimum viewing size for the number of functions the user requires to display. All functions, messages, prompts and menus are clearly presented and the DPI 145 can generate graphical displays using stored data from its extensive memory to simplify interpretation and to provide quick and easy trend analysis.

Powerful Data Processing

Comprehensive measurement processing is available on every channel to suit numerous applications including multiple scaling (selectable from 24 different units), data filtering, tare, peak/valley, average and alarms.

Operating Modes

The DPI 145 may be used in various modes of operation each with its own dedicated list of menu functions specific to the required task. The instrument is fully configurable and any input channel may be specified for all of the following modes:

Indicator

In this mode, the instrument displays any of the pressure inputs simultaneously on screen. All standard scale units are available for each individual pressure readout.

Process or mathematical functions can be applied as separate displays, each may be renamed for appropriate use or location. Up to eight pressure/process values may be displayed at any one time in this mode. The instrument can also display time by selecting the clock feature.

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Barometer

The DPI 145 may be used as a dedicated high precision barometer. Example functions include standard barometric units, three hour trend analysis with graphical output, selection of QFE or QNH for airfield applications.

Leak Test

The dedicated leak test screen simplifies the calculation of system leak rates. This is particularly effective for conforming system integrity or automated leak test applications. The test wait and test time can be specified and the leak rate in units/minute over the test period.

Switch Test

The instrument can automatically register the change state of a connected pressure switch via a rear panel connector. During a pressure switch test cycle, the contact open and close pressure values are displayed and the switch hysteresis calculated.

Instrument Set-Up

Selection of the "Set-Up" key enables variable parameters such as Pressure Scale Units (24 available), RS 232 format (printer or communication output, baud rate etc), time/date values and instrument Calibration Data (updated via a protected system).

Data Logging and Printing

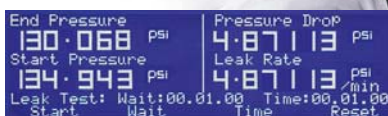
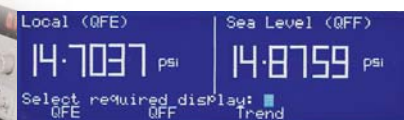
A powerful data logging facility enables measurements and processed variables to be saved to files that can then be replayed on the display in numerical or graphical form. Displays can also be recalled from the notepad memory or, alternatively, sent to a printer or PC via the RS 232 serial communications port.

Up to 20 named displays can be accommodated. The instrument will data log up to 10,000 readings dependent on screen presentation. The number of transferred readings via RS 232 may be limited by file size.

Aeronautical Option

The DPI 145 can provide the facility to operate directly in standard aeronautical units, automatically converting pressure measurements to readings of altitude and airspeed as defined by standard ICAO conversions. Features include altitude readout in feet and meters, altitude tare, calibrated airspeed in knots and km/hr, mach, rate of climb (RoC) and timed RoC, total and static pressures, and QC differential pressure. In addition, this option enables leak and switch tests in aeronautical units.

M1: 178.697 psi	g	M4: 14.707 psi	a
P1: 163.93 psi		T :	10:02
P2: 893.18 psi		P3:	14.64 psi
P4: 61.599		P5:	125.4 psi



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Interfacing

Communication

An RS 232 serial digital interface is supplied as standard in the DPI 145, allowing easy remote control for integrated computer-driven systems. The popular SCPI protocol (Standard Commands for Programmable Instruments) is used to provide standardization with other instruments. IEEE 488 communications are also available. Please refer to the options list on the back page.

Analog Output

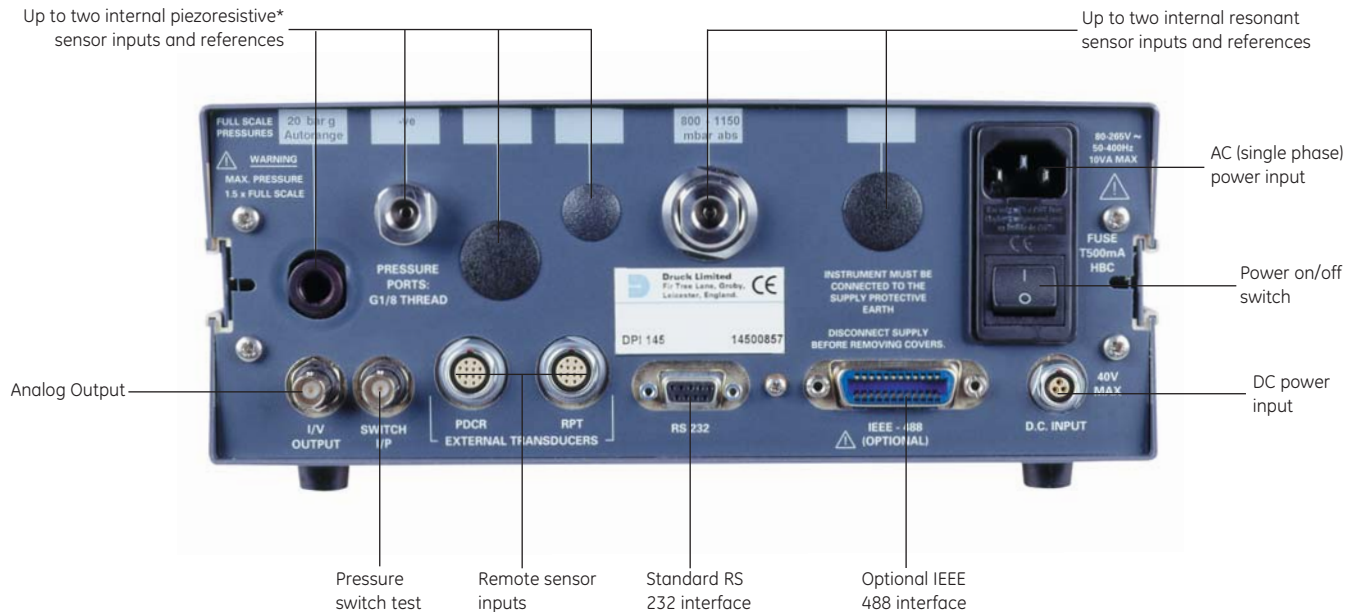
The DPI 145 is supplied with a programmable analog output. This may be assigned to any individual channel or display and set to provide an output between 0 to 30mA or 0 to 10 volts, over a user-defined range.

Remote Sensors

In addition to standard internal pressure sensors, the DPI 145 can be calibrated for use with up to 10 (one at a time) external piezoresistive sensors and one resonant sensor. This covers a wide variety of pressure ranges from 0.4 in H₂O to 10,000 psi (1 mbar to 700 bar) including gauge, absolute and differential. All external sensors are supplied with a mating connector for direct interfacing with the instrument. Please refer to the options list on the back page.

Connections

All pneumatic and electrical connections are on the rear panel for neat and easy installation. The layout is shown below.



*Note: For each piezoresistive sensor the reference is brought out to the rear panel for connection as a differential input.

DPI 145 Specifications

Pressure Measurement

Internal Sensors

Two independent fixed range piezoresistive silicon sensors or an autoranging sensor pair can be fitted. Additionally, up to two resonant silicon sensors can be accommodated.

Internal Piezoresistive Ranges

Any full scale range can be specified between:

- 1 to 1000 psi (70 mbar to 70 bar) gauge
- 1001 to 5000 psi (71 to 350 bar) sealed gauge
- 5 to 5000 psi (350 mbar to 350 bar) absolute
- 2.5 to 500 psi (175 mbar to 40 bar) differential

Note: Differential ranges standard line pressure 30 psi (2 bar), 500 psi (35 bar) (available on request). Unidirectional calibration standard, Option (C) for bidirectional. Autoranging pair: -14.5 to 300 psi (-1 to 20 bar) (includes 2 piezoresistive sensors).

Internal Resonant Sensor Ranges

The following ranges:

- 11 to 17 psi (750 to 1150 mbar) absolute (barometric)
- 0.5 to 19 psi (35 to 1300 mbar) absolute
- 0.5 to 38 psi (35 to 2600 mbar) absolute
- 0.5 to 50 psi (35 to 3500 mbar) absolute

External Transducers

Ranges available from 0.4 in H₂O up to 10,000 psi (1 mbar to 700 bar). Please refer to option (B) for details.

Safe Working Pressure

Maximum 1.5 x FS for all ranges up to 5580 psi (385 bar) with negligible effect on calibration.

Pressure Media

- Autoranging pair: any clean, dry, non-corrosive gas.
- Internal piezoresistive sensors: any gas or fluid compatible with 316L stainless steel and Hastelloy C276.
- Internal resonant sensors: any gas compatible with silicon, glass, 316L stainless steel, titanium and epoxy.
- External sensors (where specified): refer to separate sensor datasheet.

Display

1.5 in x 5 in (39 mm x 132 mm) LCD graphics panel with 240 x 64 pixels. Backlit with cold cathode tube.

Display Range

Nominally up to 110% FS. Above this value, display flashes.

Pressure Scale Units

psi, bar, in H₂O, kPa standard, 24 different user selectable scales

Response

Two readings per second maximum

Readout Resolution

±999999 capability, user programmable to lower values if required. 17 bits (0.00075% FS). Resolution will not limit accuracy on any scaling or range.

Performance

Piezoresistive Sensors 0 to 3 psi (0 to 200 mbar)

Static precision ±0.05% rdg* for values 20% to 100% FS
±0.01% F.S.* for values 0% to 20% FS
*12 month stability 0.25% Rdg.

Piezoresistive Sensors, 3 to 1000 psi (201 mbar to 70 bar)

Static precision ±0.025% rdg* for values 20% to 100% FS
±0.005% F.S.* for values 0% to 20% FS
*12 month stability 0.12% Rdg.

Piezoresistive Sensors, Ranges over 1000 psi (70 bar)

Static precision ±0.04% rdg* for values 20% to 100% FS
±0.008% FS* for values 0% to 20% FS
*12 month stability 0.2% Rdg.

Auto Range Sensors, Range -14.5 to 300 psi (-0.1 to 20.0 bar)

Static precision ±0.025% rdg* for values 1% to 100% FS
±0.00025% FS* for values below 1%FS
*12 month stability 0.01% Rdg.

**Note: The above values include non-linearity, hysteresis and repeatability. Temperature effects 0.002% Rdg/°C over the range of 50°F to 86°F (10°C to 30°C). All values ±1 digit. For gauge and differential units, regular use of the zero key is assumed.*

DPI 145 Specifications

Resonant Sensors

Barometric range 11 to 17 psi ± 0.002 psi (750 to 1150 mbar absolute ± 0.15 mbar). All other ranges $\pm 0.013\%$ FS. These figures include non-linearity, hysteresis, repeatability, and temperature effects over 50°F to 86°F (10°C to 30°C). 12 month measurement stability better than 100ppm.

Electrical

Analog Output

Proportional to selected pressure reading as either 0 to 30mA or 0 to 10 Vdc max. Zero and FS output values are user programmable. Accuracy $\pm 0.025\%$ rdg $\pm 0.01\%$ FS ± 1 digit.

Communications Interface

RS 232 serial data port fitted as standard. Communication with a host computer or printer is via the SCPI protocol.

Power Supply

A.C. 80 to 260 V, 45 to 400 Hz or d.c. 9 to 32 V. Reverse polarity and over voltage protected. Power consumption <20 watts.

Environmental

Temperature

- Calibrated 50°F to 86°F (10°C to 30°C)
- Operating 32°F to 122°F (0°C to 50°C)
- Storage -4°F to 160°F (-20°C to 70°C)

Sealing

Front panel to IP54. Case assembly to IP41

Humidity

0 - 90% RH non-condensing

Shock and Vibration

Designed to meet IEC1010

Electro Magnetic Compatibility

- Emissions EN50081-1
- Immunity EN50082-1

Electrical Safety

IEC1010

Physical

Weight

10 lb (4.6 kg) nominal

Dimensions (w x h x d)

4 in x 11 in x 10 in (110 mm x 290 mm x 250 mm) approx.

Pressure Connections

1/8 (Female BSP)

Options

(A) IEEE 488 (GPIB) Interface

Full computer control is available via a databus using the SCPI protocol. The standard IEEE parallel D connector is provided on the rear panel and all standard front panel facilities remain accessible.

(B) External Pressure Sensors

In addition to internal sensors, the DPI 145 can be calibrated for use with 10 (one at a time) external piezoresistive sensors and one resonant type sensor. These are supplied assembled with mating 12 pin connector for direct interfacing with the instrument. Cable lengths up to 33 ft (10 m) for piezoresistive sensors and 6.6 ft (2 m) for resonant sensors.

Any full scale can be specified between the ranges listed below:

- 0-1 psi to 0-1000 psi (70 mbar to 70 bar) gauge
- 0-1 psi to 0-1000 psi (71 mbar to 70 bar) sealed gauge
- 0-5 psi to 0-10,000 psi (350 mbar to 700 bar) absolute
- 0-2.5 psi to 0-580 psi (175 mbar to 40 bar) differential*

*Maximum line pressure 30 psi (2.0 bar). 40 psi (3.0 bar) available on request. Unidirectional calibrations only.

(B1) Specifies normal piezoresistive transducer temperature error bands. Refer to relevant sensor datasheet.

(B2) Specifies enhanced temperature coefficients for internal sensors.

(B3) Any non-standard sensor complete with calibration certificate as found or low pressure LPE sensor calibration. Full scale range available for LPE 9145: 0.4 in H₂O to 20 in H₂O gauge/differential (1 to 50 mbar)
Other ranges available on request.

(C) Negative Calibration

Calibration of bi-directional channels is usually in the positive direction only. If negative direction calibrations are required this option should be requested and corresponding instrument channel specified.

Note: Auto range provides -14.5 psi (-1.0 bar) calibration as standard.

DPI 145 Specifications

(D) Aeronautical Units

Additional facilities for the testing of altitude and airspeed instrumentation. Converts linear pressure values into the non linear values of feet, meters, Rate of Climb, knots, km/hr and Mach number. Altitudes from -2,000 to 100,000 ft and airspeeds from 0 to 1000 knots can be measured.

(E) Airfield Barometer

Software capability for providing barometric pressure displayed for QFE, QNH and QFF where datum heights and runway heights are given.

(F) Rack Mount

Rack mounting kit that provides a 3U (5.24 in (133 mm) high plate into which the instrument is mounted and clamped. Suitable for installation into standard 19 in (480 mm) wide rack systems.

(G) Connectors

If mating connectors are required the following should be requested:

- (G1) specifies 12 Way LEMO - external sensors (for spares)
- (G2) specifies 9 Way 'D' type - RS 232
- (G3) specifies BNC x 2 for I/V output and switch input
- (G4) specifies 3 way LEMO for d.c. input.

Supplied as Standard

An AC power connector/power lead, handbook and calibration certificate are supplied as standard with the instrument.

Calibration Standards

Instruments manufactured by GE are calibrated against precision pressure calibration equipment, which is traceable to the International standards.

Related Products

GE Sensing manufactures a comprehensive range of pressure indicators, controllers, calibrators, deadweight testers, transducers and transmitters.



Ordering Information

Please state the following (where applicable):

- 1 Model number.
- 2 Pressure range(s).
- 3 Gauge, sealed gauge, absolute or differential.
- 4 Options.
- 5 When external sensor is required:
 - (a) Pressure range and scaling
 - (b) Gauge, sealed gauge, absolute or differential
 - (c) Transducer type, from approved list
 - (d) Temperature range for sensor
 - (e) Pressure connection

For non-standard requirements, please refer to manufacturer.

Continuing development sometimes necessitates specification changes without notice.



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