The Bitronics PowerPlex instrument is a utility-grade, three-phase, digital power transducer that connects directly to instrument transformers. Direct-connect high-voltage inputs are also available.

The design and components are field-proven in the substation environment with all inputs transformer isolated.

The multiple microprocessor design uses advanced digital signal processing for true RMS measurements including power. This instrument is a multifunction transducer that calculates Voltages, Currents, Power (real, reactive, apparent), Power Factor, Frequency, and Energy Values. Real-time Harmonics, K-Factor, Displacement Power Factor, and Demand measurements with Min/Max memory are also available.

The Bitronics PowerPlex instrument is an Intelligent Electronic Device (IED) and stores these measured values in internal registers for serial communication access.

The Bitronics PowerPlex instrument is designed to meet IEC standard 1010 and is certified by Underwriters Laboratory to meet UL and CSA standards.

Features
- Multiple measurements with accuracy and fast response
- Demand/Min/Max values with local/remote reset
- Direct connect up to 480V ac
- Supports input from reference potential
- Field-selectable element switch
- RS-485, RS-232, Modbus Plus™ physical ports
- Modbus® RTU, DNP3, Modbus Plus protocol
- Analog Outputs (with optional AOC)
- Universal Power Supply option—a single supply that operates from 24, 48, 125, or 250V dc source or 115V ac service
- Self-diagnostics, network accessible
- Routine calibration not required

Benefits to Design Engineers
- Precise and timely measurement of all needed parameters
- Easy to use and mount without expensive panel rework
- Simple connections for transmitting values to serial, analog or mixed systems.
- No post installation headaches with rugged, utility grade design
- Lowers purchase, installation and operating costs

Precise and Fast Measurements
The Bitronics PowerPlex transducer is a precise instrument for measuring multiple electrical parameters. True RMS measurements are standard and accommodate signals containing harmonics in both current and voltage inputs. This results in accurate measurements despite waveform distortions.

The instruments feature many per-phase measurements for phase-balance assessment.

The Bitronics PowerPlex RTH models provide additional demand and harmonic measurements by digitally integrating instantaneous samples to obtain thermal demand and harmonic values. These demand values are used to record the minimum and maximum thermal demand values since last reset.

RTS (Modbus Plus only) models also measure volts, frequency, and phase difference from two power sources for synchronizing applications.
Accuracy
- 0.25% Accuracy Class
- Frequency Accuracy is +/- 0.01Hz
- True RMS Measurements include harmonics

Energy
- 0 to 99,999,999 kWh for Import and Export
- 0 to 99,999,999 kVARh for Import and Export
- Stored every 90 seconds in non-volatile memory. Resettable from network.

Frequency
- 45.00Hz to 75.00Hz measurement range

Phase Angle Difference (RTS only)
- +/- 0.3 degrees

Real-Time Measurements
- All Voltage, Current, Power, Power Factor, Frequency, and Energy parameters calculated every 100ms for PowerPlex RT or 150ms for PowerPlex RTH
- All Harmonics, K-factor, Displacement Power Factor, and fundamental parameters calculated every 600ms

% THD (Voltage) = \[ \frac{\sqrt{\sum V_i^2}}{V_i} \times 100\% \]
where \( V_i \) = Fundamental component of line voltage

% TDD (Current) = \[ \frac{\sqrt{\sum I_i^2}}{I_i} \times 100\% \]
where \( I_i \) = Maximum demand load current (user-programmable; if set to 0 then \( I_i = I \) for % THD measurement)

Measurements
Voltage Measurements
- True RMS L-N Voltage per Phase
- True RMS L-L Voltage per Phase
- Reference Voltage
- Fundamental Frequency
- Reference Frequency
- Phase difference between Line and Reference Voltage

Current Measurements
- True RMS Amps per Phase
- Residual Neutral Current

Power Measurements
- Watts per Phase
- Total Three Phase Watts
- VARs per Phase
- Total Three Phase VARs
- VA per Phase
- Total Three Phase VA
- Power Factor per Phase
- Total Three Phase Power Factor

Energy Measurements
- Kilowatt-hours, Import and Export
- KiloVAR-hours, Import and Export

Demand Min/Max Measurements
(RTH Models only)
- Present and Peak Amp Demand per Phase
- Present and Peak Residual Neutral Amp Demand
- Present, Max and Min Volt Demand per Phase
- Present, Max and Min Total Watt Demand
- Present, Max and Min Total VAR Demand
- Present, Max and Min Total VA Demand

Harmonic Measurements
(RTH Models only)
- Over 200 values: % TDD, % THD, Individual Harmonic Components, K-Factor and Displacement Power Factor; includes many per phase and Peak values

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1. Calculated from L-N inputs on 4-Wire systems
2. 4-Wire systems only
3. Only available on PowerPlex RTS models
Serial Transmission Options
Reduce wiring, terminations and input signal conditioning costs by transmitting the PowerPlex measurements to other digital devices using serial data communications. The PowerPlex family provides several serial options to interface with a wide variety of RTUs, PLCs, PCs, and other digital devices.

The Modbus Plus serial output option is a high-speed, high-capacity serial bus and protocol that is very suitable for real-time distributed control and automation strategies. The RS-485 bus is well suited for a medium-speed multiple instrument monitoring system and has excellent noise immunity. The RS-232 allows for short interconnection with a broad range of digital devices. The RS-485 and the RS-232 serial ports can be equipped with either Modbus RTU or DNP3 protocol. This provides for five combinations of serial ports and protocols that form “network connections.”

Protocol Choices
- **Modbus Plus**, certified by Schneider Electric, supports:
  - 64 user selectable addresses; Global Data, Read Holding Registers, and Preset Single/Multiple Registers for energy reset, demand reset, and scaling.
- **Modbus RTU Slave** supports:
  - 247 user selectable addresses; Read Holding Registers, and Preset Single/Multiple Registers for energy reset, demand reset, and scaling.
- **DNP3 Slave** supports:
  - 256 user selectable addresses; Read by class, object or point; and Direct Operate commands for energy reset, demand reset, and scaling. RTH models include a configuration register to limit the class 0 response.

Analog Transmissions Options
Transmit the Bitronics PowerPlex measurements to other devices using analog signals from a Bitronics Analog Output converter (AOC). The AOC communicates with the Bitronics PowerPlex serial port using Modbus RTU or DNP3 protocol over an RS-485 bus, and then converts the register values to analog signals proportional to these measurements. Using a bus provides for several useful configurations. The RS-485 bus allows for configurations with multiple instruments with cable runs up to 4000 feet (1200M). This distributed architecture also allows Hybrid configurations for use with mixed analog and serial solutions.

Another useful feature of the distributed architecture is that the PowerPlex instruments can continue to be used, at no additional costs, when later upgrading to a serial communications network.

The AOC is equipped with 8 analog outputs, using either 0 - 1mA or 4 - 20mA signals.
Easy Installation
The Bitronics PowerPlex instruments are designed to make installation and maintenance a snap. They are loaded with features such as a metal case design with large stud terminals, mounting holes that match older power transducer designs, and wide temperature range. All Bitronics PowerPlex models are available with the universal power supply which can operate from a wide variety of DC or AC sources.

The address and element-select switches are easily accessible from the front of the instrument. Diagnostic codes are available from the internal registers. Scaling for primary-side energy values, when connected to PTs and CTs, is provided through CT and PT ratios written into registers over the network.

A free utility program is available for reading and writing ratios through the serial port.

Auxiliary Power
Four power supply options
• 115V ac
• 230V ac
• 480V ac
• Universal AC/DC supply: 55 - 200V ac or 20 - 280V dc

BiView Utility Software
Setup and evaluation software is available
• View all register values
• Write CT & PT ratios
• Reset energy/demand

Environment
• -30°C to 70°C operating temperature
• 2500V ac isolation to case
• 1500V ac minimum isolation input to output
• Meets IEEE/ANSI C37.90 Surge Withstand
• Transducer meets IEC standard 1010-1 and UL certified to meet UL3111-1 and CAN/CSA C22.2 No. 1010.1-92 standards

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(1) PowerPlex diagnostic LED provides communication status

(2) PowerPlex power-on LED

(3) Element switches
• 2-Element mode
• 2½-Element mode
• 3-Element mode (Not available on RTS models)

(4) PowerPlex address switches

(5) Matches Watt/VAR analog power transducer mounting

(6) Modbus Plus port shown. RS-232 and RS-485 are 4-screw barrier strip terminal blocks.

Provided with external MOV transient protection for field replacement. (Not shown but mounts on power supply terminals.)
**Current Inputs**

*All Bitronics PowerPlex Instruments*

Supports the use of Current transformers (CT). These connections are made to internal transformers to provide excellent, utility grade isolation.

Scaling for primary-side energy values when connected to CTs is provided through a CT ratio written into the instrument through the serial port.

**Voltage Inputs**

*Bitronics PowerPlex RT and Bitronics PowerPlex RTH Instruments*

Supports the use of Potential transformers (PT) or Voltage transformers (VT) for high voltage applications. These connections are made to internal transformers to provide excellent utility grade isolation.

Scaling for primary-side energy values when connected to PTs is provided through a PT ratio written into the instrument through the serial port. The graphic shows a wiring schematic for a 3-Wire system. The PowerPlex family also supports 4-Wire systems which is field selectable by the element switch position.

**Bitronics PowerPlex RTS Instruments**

Supports the use of Potential transformers (PT) or Voltage transformers (VT) for high voltage applications. Also supports the use of PT or VT from a reference source. These inputs are transformer-isolated to provide excellent utility grade isolation. Scaling for primary-side energy values when connected to PTs is provided through a PT ratio written into the instrument through the serial port.

The graphic shows a wiring schematic for a 3-Wire system. The PowerPlex RTS also supports 2½-Element 4-Wire systems which is field selectable by the element switch position. (Does not support 3-Element because third PT input is used for reference voltage input.)

The graphics show a wiring schematic for a 3-Wire system. The PowerPlex family also supports 4-Wire systems which is field selectable by the element switch position.

**Voltage Inputs, Bitronics PowerPlex RT C and RTH C**

- The MTWIN 1B and MTWDN1B models are used for 240/208V L-L ac nominal, 3-Wire systems, and for 120 L-N ac nominal, 4-Wire systems, range 0-375V ac
- The MTWIN2B and MTWDN2B models are used for 480 L-L ac nominal, 3-Wire systems and for 277 L-N ac nominal, 4-Wire systems, range 0-520V ac
- 50Hz or 60Hz nominal frequency
- Voltage signal burden <1.2mA at 480V ac (0.6 VA)

**Voltage Inputs, Bitronics PowerPlex RT C and RTH C**

- 120V ac nominal, range 0 to 150V ac
- 50Hz or 60Hz nominal frequency
- Voltage signal burden <1mA at 120V ac (0.1 VA)

**Bitronics PowerPlex RT C and Bitronics PowerPlex RTH C Instruments**

Supports the direct connection of up to 480V ac L-L nominal for low voltage applications. These connections are made to internal transformers and continue to provide excellent utility grade isolation. Scaling is fixed for the appropriate voltage input range.
Select Models

- **Bitronics PowerPlex RT**
  2, 2½ or 3-Elements / field selectable
  Model: MTWIN3B
  RS-232 or RS-485/ Modbus RTU or DNP3 or Modbus Plus
  **See Order Guide 167**

- **Bitronics PowerPlex RT C**
  2 or 3-Elements / field selectable
  Models: MTWIN1B or MTWIN2B
  RS-232 or RS-485/Modbus RTU or DNP3; or Modbus Plus
  **See Order Guide 177**

- **Bitronics PowerPlex RTS**
  2 or 2½-Elements / field selectable
  Models: MTWIN4B, MTWIN5B, MTWIN6B / Phase A, B, or C Reference
  Modbus Plus
  **See Order Guide 179**

- **Bitronics PowerPlex RTH**
  2, 2½ or 3-Elements / field selectable
  Models: MTWD3B
  RS-232 or RS-485/ Modbus RTU or DNP3 or Modbus Plus
  **See Order Guide 168**

- **Bitronics MultiComm RTH C**
  2 or 3-Elements / field selectable
  Models: MTWIDN1B or MTWIDN2B
  RS-232 or RS-485/Modbus RTU or DNP3; or Modbus Plus
  **See Order Guide 178**

Accessories

- **Analog Output Converter**
  0 - 1mA, 4 - 20mA / Models: NAO8101 or NAO8102;
  NAO8103 or NAO8104
  RS-485/Modbus RTU; RS-485/DNP3

- **BiView**
  Setup and evaluation software