

- (1) High Voltage and (1) High Current Input
- Multiplication for Apparent Power Calculation
- 0-300 VAC or VDC Voltage Input
- 0-5 AAC or ADC Current Input
- NEMA 4X, IP65 Front
- Input Power Options Include 85-265 VAC or 12-24 VDC
- Large Dual-Line 6-Digit Display, 0.60" & 0.46"
- Optional SunBright Display Models for Outdoor Applications
- Programmable Display & Function Keys
- 2 or 4 Relays + Isolated 4-20 mA Output Options
- External 4-Relay & Digital I/O Expansion Modules
- RS-232, & RS-485 Serial Communication Options
- Modbus® RTU Communication Protocol Standard
- Onboard USB and MeterView<sup>®</sup> Pro Programming Software





#### INTRODUCTION

The PROVU® PD6400 is a multipurpose, easy to use high voltage and current input meter ideal for measuring direct voltage and current or the output from voltage shunts and current transformers. It has one 0-300 VAC or VDC voltage input and one 0-5 AAC or ADC current input. The meter may be used with a single voltage or current input, or to measure both simultaneously. A math channel P calculates apparent power as the product of the voltage and current inputs.

The PD6400 can display voltage, current, and apparent power. The dual line display can show any two parameters simultaneously, or alternate between any parameters as well as their programmable units and tags.

A fully loaded PD6400 meter has the following: four SPDT relays, 4-20 mA output, and a 24 VDC power supply. The PD6400 capabilities may be enhanced by adding the following external expansion modules: four SPST relays; creating an eight-relay meter, two digital I/O modules with four inputs and four outputs each, serial communication adapters for use with MeterView Pro or Modbus RTU, and a dual 4-20 mA expansion module; for a total of three 4-20 mA analog outputs.

#### **KEY FEATURES**

#### Precise, Accurate, and More Informative

PROVu's large 0.6" upper display provides a highly accurate and precise view of the high voltage/high current measurement, while the lower display can also provide a clearly identifiable custom tag. Its 24-bit A/D is accurate to  $\pm 0.03\%$  of calibrated span  $\pm 1$  count. The PD6400's display also has lead zero blanking capability.

#### Configurable

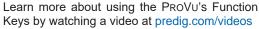
The upper display can be programmed to indicate PV, maximum (peak), minimum (valley), alternating maximum/minimum, one of eight alarm set points, or Modbus input. The lower display can also be configured to display engineering units, set points, user defined legends, or simply turned off.

# Standard LED and Optional SunBright LED Display Models

The PROVU'S standard and SunBright display models feature extraordinarily bright LED displays. They are perfect for indoor and outdoor applications where visibility may be impaired by smoke, fog, dust, or distance. The intensity on the SunBright display model is so high it can be read even in the brightest sunlight.

#### **Function Keys**

There are three function keys available to the user. These keys can be programmed to trigger certain events (i.e. acknowledge alarms, reset max and/or min, disable/enable output relays, or hold current relay states), provide direct menu access points, and more.





#### Free USB Programming Software & Cable

The PRoVu® comes preloaded with free **MeterView® Pro** programming software that connects and installs directly to your PC with a standard USB cable, also provided free with each instrument. This eliminates the need to insert CDs, install drivers, or download software from the internet. The software will allow you to configure, monitor, and datalog a PRoVu® PD6400 using your PC. Just simply connect the meter to your PC with the USB cable and within minutes you will be programming it.





#### Rugged & Durable

A unique front panel design makes the PROVU nearly impenetrable in typical applications. Here, the PROVU easily survives a direct hit on the display from a heavy 2" solid stainless steel ball dropped from a height of eight feet.

#### Easy-to-Use

The user friendly dual-line display makes the PROVU easy to set up & program. No jumpers to set for input selection. All setup & programming are done via the front panel. Three levels of password protection help maintain the reliability of the programming.

#### **Display Single or Dual Input**

The PRoVu PD6400 has a rather unique display that can represent the measured input in a different form (i.e. Volts & Amps). Please see the examples shown below. Both displays are independently scaled and are based on the 0-5 A or 0-300 V input signal. This function can be used for Value & Volts, Value & Amps, Voltage Value & Current Value, and Volts & Amps.



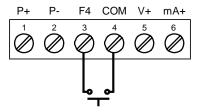
**Alternating Input Value and Units** 

#### **Advanced Linearization Capability**

The PRoVu includes a 32-point linearizer for non-linear Current or Voltage signals. The meter's factory default setting is for 2-point linearization. Up to 32 linearization points can be user-selected for each channel, Voltage or Current, under the Linear Function. Precision Digital's free MeterView® Pro PC-based programming software greatly simplifies the construction of the linearization tables. The software enables the user to save this data to the meter and/or PC.

#### **On-Board Digital Input**

The PD6400 includes a digital input as a standard feature. This digital input can be assigned functionality such as alarm acknowledgement, as well as enable, disable, or force relays on from a signal from a PLC or relay on other equipment, and much more. This is ideal for installations where the meter is inaccessible behind a cover, or where an additional function key is needed for customized operation.



#### Max/Min Display

Max/Min (or Peak/Valley) is standard on the PROVU PD6400. Either display can be configured to show either maximum or minimum excursion since last reset. The displays can also be configured to toggle between Max and Min values. Both values can be simply reset from the front panel.

#### DIGITAL COMMUNICATIONS

#### Modbus® RTU Serial Communications

With the purchase of a serial communication adapter, PROVU meters can communicate with any Modbus Master device using the ever-popular Modbus communications protocol that is included in every PROVU. This greatly increases the flexibility of the meter. Modbus provides much more capability than reading PV and writing set points. Below are some examples of other things that can be done with PROVU's Modbus communications.

- · Send a 6-character message to the lower display upon an event
- Convert a digital value to a 4-20 mA signal
- Remote user control (i.e. change set points, acknowledge alarms)
- · Input a Modbus digital PV (in place of analog input)
- · Remote override of any, or all, relays and analog outputs



#### ProVu VIDEOS

Watch a quick demonstration on how the PROVU works and also how the function keys can simplify functionality. These and other videos are available at www.predig.com/videos.

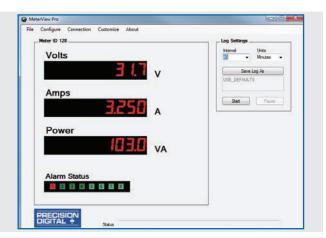


Please see the following page for more information.

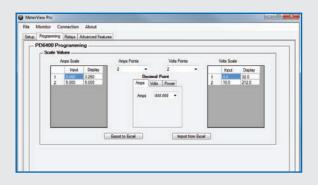
#### METERVIEW® PRO SOFTWARE

Configure, monitor, and datalog a PD6400 from a PC using Meter View Pro Software (available with each PRoVu meter via USB or for download at <a href="https://www.predig.com">www.predig.com</a>).

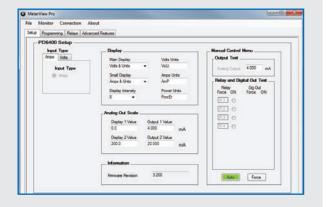
# Monitor & Datalog



# Linearization Feature











#### FIELD EXPANSION MODULES

Add functionality to the PROVu in the field with easy-to-install external expansion modules. Add USB, RS-232, or RS-485 communications, I/O modules (up to 2), and 4-relay expansion module. The menu items for these modules do not appear until the module is connected, simplifying the basic menu. Relay and digital I/O modules are shown below with optional DIN rail mounting kit, P/N PDA1002.



#### PDA1044 I/O Expansion Module

Four digital inputs and four digital outputs are available per expansion module. The PROVU meter will accept two of these modules. External digital inputs can function similarly to the front panel function keys or on-board digital input F4. They can be configured to trigger certain events (i.e. acknowledge/reset alarms, reset max and/or min values, disable/enable all output relays, and hold current relay states), provide direct menu access point, or mimic front panel keys. The I/O module can be used to configure the PROVU remotely, in essence giving the user control of the four front panel push buttons. This feature is particularly useful if the meter is mounted inside an explosion-proof enclosure.

Digital outputs can be used to remotely monitor PROVu's alarm relay output states, or the states of a variety of actions and functions executed by the meter.

#### PDA1004 Relay Expansion Module

An external module containing four 3 A Form A (SPST) relays can be added to the PROVU at anytime. Removable screw terminal blocks accept 12 to 22 AWG wire.





#### PDA1011 Dual Isolated 4-20 mA Expansion Module

Add analog output to the PROVU PD6400 at any time with dual isolated analog output expansion module PDA1011.

Connect the expansion module to the meter using the M-Link Connector on the PD6400. Use only cables provided by Precision Digital in order to protect both the meter and the equipment.

#### PDA1232 & PDA1485 Communication Modules

Serial communications on the PROVU can be added anytime with external PDA1232 (RS-232) or PDA1485 (RS-485) communication adapters.

Free Modbus protocol included for use with PROVu serial communications modules.

#### **OUTPUTS**

#### **Relay Outputs**

The PRoVu has up to four 3 A Form C relays (SPDT) with multiple power loss fail-safe options. Relays can be configured for proper protective action upon input loop break. Relay ON and OFF delay times are user adjustable. Up to eight front panel indicators show alarm and/or relay state. All relays can be configured for 0-100% deadband.

#### **Relay Operation/Configuration**

There are powerful relay functions that can be configured in the PROVU meter, including:

- Automatic reset only (non-latching)
- · Automatic + manual reset at any time (non-latching)
- · Latching (manual reset only)
- Latching with clear (manual reset only after alarm condition has cleared)
- · Pump alternation control (automatic reset only)
- Sampling (activated for a user-specified time)
- · User selectable fail-safe operation
- · Relay action for loss (break) of 4-20 mA input signal
- · Time delay (on and off), independent for each relay
- · Manual control mode
- · Interlock relay mode

#### **Analog Output**

The isolated analog retransmission signal can be configured to represent the process variable (PV), maximum (peak) value, minimum (valley) value, the value for any of the eight relay set points, or Modbus input. While the output is nominally 4-20 mA, the signal will accurately accommodate under- and over-ranges from 1 to 23 mA.

#### **Manual Output Control**

Take control of any output with this feature. All relays can be forced ON or OFF, and the 4-20 mA output signal can be set to any value within its range. When the relays and 4-20



mA output are controlled manually, an LED labeled "M" is turned on and the associated Alarm LEDs (1-8) flash every 10 seconds indicating that the meter is in manual control mode.

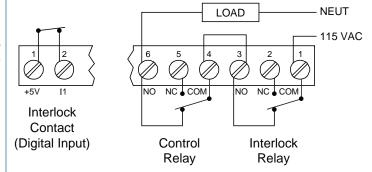
#### **Isolated Transmitter Power Supplies**

A powerful 24 V @ 200 mA power supply is a standard feature on the PRoVu meter. It can be configured for 5, 10, or 24 V (default) by means of a simple internal jumper (see manual). An additional power supply (24 V @ 40 mA) is standard with the 4-20 mA output option.

#### Interlock Relay(s)

This function allows a process to use one or more very low voltage input signals or simple switch contacts to control the state of one or more internal "interlock" relays. A violation (i.e. loss of input, open switch, or open circuit) forces one or more N/O interlock relay contacts to open. One input can be used in series with a number of interlock switches, or up to eight inputs can be required to force-on one (or more) internal interlock relays. Please see *Application Note AN-1008* on our website for more information. Requires PDA1044 Digital I/O module or use of on-board digital input F4.

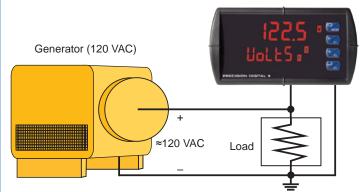
#### **Interlock Relay Connections**



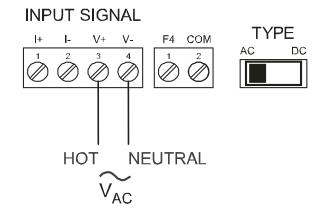
#### **APPLICATION EXAMPLES**

The PD6400 PRoVu can be used to display application data for voltage, current, or both. Each Channel, Voltage or Current, can be scaled independently. The following examples show just a few of the PD6400's application capabilities using generators and transformers. Each example is followed by a wiring diagram that shows proper switch position for the meter.

#### Voltage Measurement for a Generator Driving a Load

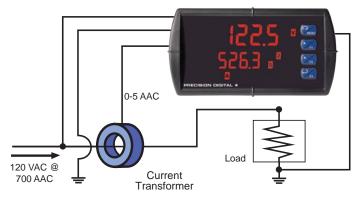


**Voltage Input Application Example** 

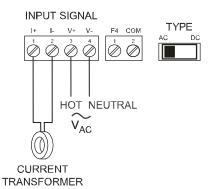


Voltage Input Wiring Example with AC Switch Selected

#### **Voltage & Current Measurement for a Transformer Driving a Load**

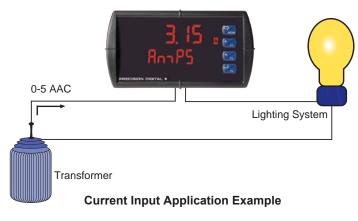


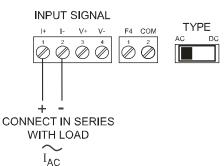
#### **Voltage/Current Input Application Example**



Voltage/Current Input Wiring Example with AC Switch Selected

#### **Current Measurement for a Lighting System**





**Current Input Wiring Example with AC Switch Selected** 

#### **NEMA 4 & 4X FIELD ENCLOSURES**

Precision Digital offers a variety of rugged enclosures that provide a high degree of protection against harsh operating environments. Thermoplastic and stainless steel NEMA 4X, and painted steel NEMA 4 enclosures for up to 10 PRoVu meters are available.



PDA2302 Plastic Economical



**PDA2600** Stainless Steel



**PDA2706** Steel



PDA2811 Plastic Low-Cost



**PDA2812** Plastic Low-Cost

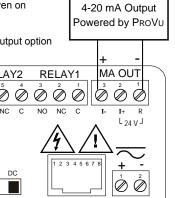


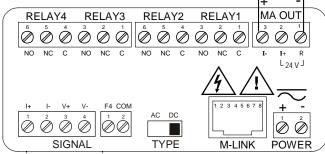
**PDA3400** Plastic Internally Mounted

See our complete offering at www.predig.com/esu

#### CONNECTIONS

- Form C (SPDT) relays
- Two isolated supplies available even on 12/24 VDC input power models
- · Removable terminal blocks
- 2 or 4 relays + isolated 4-20 mA output option





- Input Power Options: 85-265 VAC or 12/24 VDC
- Voltage & current inputs
- · No jumpers needed for V/mA input selection
- M-Link for adding expansion modules
- · Digital input (F4)

#### **SPECIFICATIONS**

Except where noted all specifications apply to operation at +25°C.

#### General

**Display:** Upper display: 0.60" (15 mm) high. Lower display: 0.46" (12 mm) high. Both are 6 digits (-99999 to 999999), with red LEDs.

Display Intensity: Eight user-selectable intensity levels

Display Update Rate: 5/second (200 ms) Overrange: Display flashes 999999 Underrange: Display flashes -99999

**Display Assignment:** The main (Big) and secondary (Little) displays may be assigned to process values for Channels A (Ch-A, current), V (Ch-V, voltage), or P (Ch-P, apparent power); toggle between (Ch-A & Ch-V, Ch-A & Ch-P, Ch-V & Ch-P, and Ch-A, Ch-V, & Ch-P); relay set points; max and/or min values for CH-A, Ch-V, or Ch-P; CH-A and units; Ch-V and units; Ch-P and units; or Modbus input. The lower display may also be set to show engineering units or be set to off, with no display.

Front Panel: NEMA 4X, IP65

**Programming Methods:** Four front panel buttons, digital inputs, PC and MeterView Pro software, Modbus registers, or cloning using Copy function.

**F4 Digital Input Contacts:** 3.3 VDC on contact. Connect normally open contacts across F4 to COM.

F4 Digital Input Logic Levels: Logic High: 3 to 5 VDC

Logic Low: 0 to 1.25 VDC

Noise filter: Programmable from 2 to 199 (0 will disable filter)
Filter Bypass: Programmable from 0.1 to 99.9% of calibrated span
Recalibration: Calibrated at the factory. Recalibration is recommended

at least every 12 months.

**Max/Min Display:** Max / min readings reached by the process are stored until reset by the user or until power to the meter is cycled.

**Password:** Three programmable passwords restrict modification of programmed settings.

**Non-Volatile Memory:** All programmed settings are stored in non-volatile memory for a minimum of ten years if power is lost.

Power Options: 85-265 VAC 50/60 Hz, 90-265 VDC, 20 W max, or optional model with 12-24 VDC  $\pm 10\%$ , 15 W max.

**Fuse:** Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 meters may share one 5 A fuse.

Normal Mode Rejection: Greater than 60 dB at 50/60 Hz

**Isolation:** 500 V AC/DC potential allowed between voltage and current input channels. Channels isolated by 3 M $\Omega$  impedance

4 kV input/output-to-power line 500 V input-to-output or output-to-P+

Overvoltage Category: Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.

#### **Environmental:**

Operating temperature range: -40 to 65°C Storage temperature range: -40 to 85°C Relative humidity: 0 to 90% non-condensing

**Connections:** Removable screw terminal blocks accept 12 to 22 AWG wire, RJ45 for external relays, digital I/O, and serial communication adapters.

**Enclosure:** 1/8 DIN, high impact plastic, UL 94V-0, color: black **Mounting:** 1/8 DIN panel cutout required: 3.622" x 1.772"

(92 mm x 45 mm). Two panel mounting bracket assemblies are provided. **Tightening Torque:** Screw terminal connectors: 5 lb-in (0.56 Nm)

Dimensions: 4.68" x 2.45" x 5.64" (119 mm x 62 mm x 143 mm) (W x H x D)

Weight: 9.5 oz (269 g)

UL File Number: UL & C-UL Listed. E160849; 508 Industrial Control Equipment.

Warranty: 3 years parts & labor

USB Connection: Compatibility: USB 2.0 Standard, Compliant

Connector Type: Micro-B receptacle Cable: USB A Male to Micro-B Cable

Driver: Windows 98/SE, ME, 2000, Server 2003/2008, XP 32/64-Bit, Vista 32/64-Bit, Windows 7 32/64-Bit, Windows 10 32/64-Bit

Power: USB Port

#### Voltage and Current Inputs

High Voltage Input: One high voltage input (Channel V) 0-300 VDC or

VAC; Switch Selectable, Modbus PV (Slave)

**High Current Input:** One high current input (Channel A) 0-5 AAC or ADC; Switch Selectable, Modbus PV (Slave)

**Channels:** Channel A, Channel V, Channel P (Math Channel for Apparent

Power)

**AC/DC Selection:** Switch selectable for AC or DC inputs. Channels A and V share AC/DC selection.

**Apparent Power Math:** Apparent power P calculated as P = ((A \* V) + C) \* F **Programmable Constants:** Constant C (Adder): -99.999 to 999.999,

default: 0.000. Constant F (Factor): 0.001 to 999.999, default: 1.000.

Accuracy: ADC: 0.03% Full Scale ±1 count,

AAC: 0.1% Full Scale ±1 count, VDC: 0.05% Full Scale ±1 count,

VAC: 0.15% Full Scale ±1 count, square root & programmable exponent accuracy range: 10-100% of calibrated span

**Temperature Drift:** 0.005% of calibrated span/°C max from -40 to 65°C ambient

Signal Input Conditioning: Linear, square root, programmable

exponent, or round horizontal tank volume calculation.

Multi-Point Linearization: 2 to 32 points for Channel A and V

**Low-Flow Cutoff:** 0-999999 (0 disables cutoff function). Independent for Channel A and V.

Decimal Point: Up to five decimal places or none: d.ddddd, dd.dddd, ddd.ddd, ddddddd, or dddddd.

Calibration Range:

close together.

Input Channel	Input Range	Minimum Span Input 1 & Input 2
٨	±/- 0-5 ADC/0-5 AAC	±/- 0.005 ADC/0.010 AAC

**V** +/- 0-300 VDC/0-300 VAC +/- 0.1 VDC/0.3 VAC Note: An error message will appear if the input 1 and input 2 signals are too

Input Impedance: Voltage Input: greater than 3 M $\Omega$ .

Current Input: 50 - 100 Ω.

Input Overload: Voltage input protected up to 500 VDC

Current input protected up to 10 A by a 10A/300V fast acting nonresettable fuse. Fuse is NOT resettable after a fault; unit must be factory reconditioned.

**F4 Digital Input Contacts:** 3.3 VDC on contact. Connect normally open contacts across F4 to COM.

F4 Digital Input Logic Levels: Logic High: 3 to 5 VDC

Logic Low: 0 to 1.25 VDC

#### Relays

**Rating:** 2 or 4 SPDT (Form C) internal and/or 4 SPST (Form A) external; rated 3 A @ 30 VDC and 125/250 VAC resistive load; 1/14 HP ( $\approx$  50 watts) @ 125/250 VAC for inductive loads such as contactors, solenoids, etc.

**Noise Suppression:** Noise suppression is recommended for each relay contact switching inductive loads.

Relay Assignment: Each relay independently assigned to Ch-A, Ch-V, CH-P. or Modbus

Deadband: 0-100% of span, user programmable

**High or Low Alarm:** User may program any alarm for high or low trip point. Unused alarm LEDs and relays may be disabled (turned off).

**Relay Operation:** automatic (non-latching), latching (requires manual acknowledge), sampling (based on time), pump alternation control (2 to 8 relays), Off (disable unused relays and enable interlock feature, manual on/off control mode).

Relay Reset: User selectable via front panel buttons or digital inputs, or PC.

- 1. Automatic reset only (non-latching), when input passes the reset point.
- 2. Automatic + manual reset at any time (non-latching).
- 3. Manual reset only, at any time (latching).
- 4. Manual reset only after alarm condition has cleared (latching).

  Note: Front panel button or digital input may be assigned to acknowledge relays programmed for

**Time Delay:** 0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay.

### 6400 PROVu® High Voltage & Current Meter

Fail-Safe Operation: Programmable and independent for each relay. Note: Relay coil is energized in non-alarm condition. In case of power failure, relay will go to

Auto Initialization: When power is applied to the meter, relays will reflect the state of the input to the meter.

Break Condition Operation: Relay condition when sensor break detected. Programmable independently for each relay as On, Off, or Ignore (maintain last condition).

#### Modbus® RTU Serial Communications

Meter Address/Slave ID: 1 - 247 Baud Rate: 300 - 19,200 bps

Transmit Time Delay: Programmable between 0 and 199 ms

Data: 8 bit (1 start bit, 1 or 2 stop bits) Parity: Even, odd, or none with 1 or 2 stop bits Byte-to-Byte Timeout: 0.01 - 2.54 seconds Turn Around Delay: Less than 2 ms (fixed)

Note: Refer to the PROVU® Register Tables located at www.predig.com for details.

#### Isolated 4-20 mA Transmitter Output

Output Source: Process channel A, V, or P, max or min for channel A, V, or highest or lowest max or min of A and V, set points 1-8, Modbus input,

or manual control mode

Scaling Range: 1.000 to 23.000 mA for any display range Calibration: Factory calibrated: 4.000 to 20.000 = 4-20 mA output

Analog Output Programming: 23.000 mA maximum for all parameters:

Overrange, underrange, max, min, and break Accuracy:  $\pm 0.1\%$  of span  $\pm 0.004$  mA

Temperature Drift: 0.4 µA/°C max from 0 to 65°C ambient,

0.8 µA/°C max from -40 to 0°C ambient

Note: Analog output drift is separate from input drift.

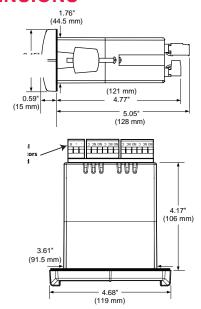
Isolated Transmitter Power Supply: Terminals I+ & R: 24 VDC ± 10%. Isolated from the input at >500 V. May be used to power the 4-20 mA output or other devices. All models rated @ 40 mA max.

External Loop Power Supply: 35 VDC maximum

Output Loop Resistance:

Power supply Minimum Maximum 24 VDC 700 O 10 O 35 VDC (external) 100 Ω 1200 Ω

#### DIMENSIONS



- 1. Panel cutout required: 1.772" x 3.622" (45 mm x 92 mm)
- 2. Panel thickness: 0.040 0.250" (1.0 mm 6.4 mm)
- 3. Mounting brackets lock in place for easy mounting
- 4. Clearance: Allow 6" (152 mm) behind the panel

#### ORDERING INFORMATION

ProVu® PD6400 • Standard Models			
85-265 VAC Model	12-24 VDC Model	Options Installed	
PD6400-6R0	PD6400-7R0	None	
PD6400-6R2	PD6400-7R2	2 Relays	
PD6400-6R3	PD6400-7R3	4-20 mA Output	
PD6400-6R4	PD6400-7R4	4 Relays	
PD6400-6R5	PD6400-7R5	2 Relays & 4-20 mA Output	
PD6400-6R7	PD6400-7R7	4 Relays & 4-20 mA Output	
Note: 24 V Transmitter power supply standard on all models.			

ProVu® PD6400 ∙ SunBright Display Models			
85-265 VAC Model	12-24 VDC Model	Options Installed	
PD6400-6H0	PD6400-7H0	None	
PD6400-6H2	PD6400-7H2	2 Relays	
PD6400-6H3	PD6400-7H3	4-20 mA Output	
PD6400-6H4	PD6400-7H4	4 Relays	
PD6400-6H5	PD6400-7H5	2 Relays & 4-20 mA Output	
PD6400-6H7	PD6400-7H7	4 Relays & 4-20 mA Output	
Note: 24 V Transmitter power supply standard on all models.			

Accessories		
Model	Description	
PDA1002	DIN Rail Mounting Kit for Two Expansion Modules	
PDA1004	4-Relay Expansion Module	
PDA1011	Dual Isolated 4-20 mA Expansion Module	
PDA1044	4 Digital Inputs & 4 Digital Outputs Module	
PDA1232	RS-232 Serial Adapter	
PDA1485	RS-485 Serial Adapter	
PDA7485-I	RS-232 to RS-422/485 Isolated Converter	
PDA7485-N	RS-232 to RS-422/485 Non-Isolated Converter	
PDA8232-N	USB to RS-232 Non-Isolated Converter	
PDA8485-I	USB to RS-422/485 Isolated Converter	
PDA8485-N	USB to RS-422/485 Non-Isolated Converter	
PDX6901	Suppressor (snubber): 0.01 μF/470 Ω, 250 VAC	

#### Your Local Distributor is:

#### Disclaimer

The information contained in this document is subject to change without notice. Precision Digital Corporation makes no representations or warranties with respect to the contents hereof, and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose. ©2015 -2016 Precision Digital Corporation. All rights reserved.

> LDS6400 E 04/18

