

ProtEX-MAX PD8-6080/PD8-6081 Modbus® Scanners

Data Sheet



- Fully Approved Explosion-Proof Modbus® Scanners
- Modbus® RS-485 RTU Scanner as Master, Slave, or Snoper
- Dual Analog Inputs (0-20 mA, 4-20 mA, 0-5 V, 1-5 V, and ± 10 V)
- On-Board USB & RS-485 Serial Communication Standard
- Decimal or Feet & Inches (with Eighths & Sixteenths) Display Options
- Poll and Display up to 16 Process Variables
- Add, Diff, Avg, Multi, Div, Min, Max, Weighted Avg, Ratio, Concentration, & More
- Dual-Line 6-Digit Display, 0.60" (15.2 mm) & 0.46" (12.0 mm)
- CapTouch Through-Glass Button Programming
- Display Mountable at 0°, 90°, 180°, & 270°
- 4 Relays with Interlocking Capability + Isolated 4-20 mA Output Option
- Password Protection
- Free PC-Based, On-Board, ScanView USB Programming Software
- SunBright Display Standard Feature; Great for Outdoor Applications
- Operating Temperature Range: -55 to 65°C (-67 to 149°F)
- CSA Certified as Explosion-Proof / Dust-Ignition-Proof / Flame-Proof
- ATEX and IECEx Certified as Flame-Proof
- Input Power Options: 85-265 VAC / 90-265 VDC or 12-24 VDC / 12-24 VAC
- Multi-Pump Alternation Control
- 32-Point, Square Root, or Exponential Linearization
- Flanges for Wall or Pipe Mounting
- Explosion-Proof Aluminum or Stainless Steel NEMA 4X / IP68 Enclosures
- Four 3/4" NPT Threaded Conduit Openings
- Stainless Steel Pipe Mounting Kit
- Stainless Steel Tag Available
- 3-Year Warranty

The Complete **ProtEX™** Series MAX



PD8-154
**4-Point Alarm
Annunciator**



PD8-6100
Strain Gauge Meter



PD8-158
**8-Point Alarm
Annunciator**



PD8-6200
**Analog Input
Flow Rate/Totalizer**



PD8-765
**Process &
Temperature Meter**



PD8-6210
**Analog Input Batch
Controller**



PD8-6000
Process Meter



PD8-6262
**Analog Dual-Input
Flow Rate/Totalizer**



PD8-6001
**Feet & Inches
Level Meter**



PD8-6300
**Pulse Input
Flow Rate/Totalizer**



PD8-6060
**Dual-Input
Process Meter**



PD8-6310
**Pulse Input
Batch Controller**



PD8-6080
**Modbus® Scanner
with Dual Analog Input**



PD8-6363
**Pulse Dual-Input
Flow Rate/Totalizer**



PD8-6081
**Feet & Inches
Modbus® Scanner**



PD8-7000
Temperature Meter

Go to PREDIG.COM for details on the entire ProtEX-MAX Series Meters



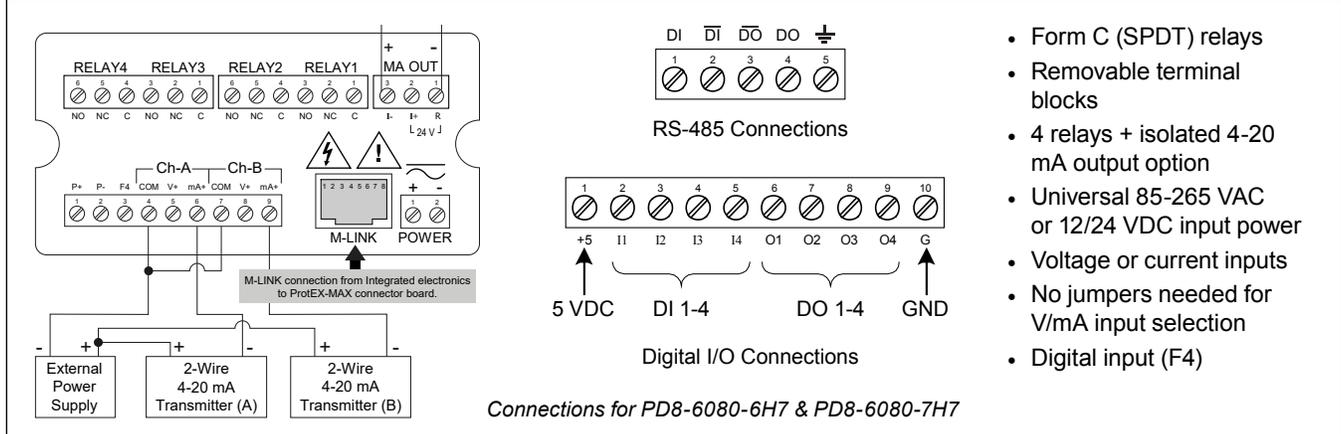
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OVERVIEW



Connections



The Only Explosion-Proof Modbus Scanner You Will Ever Need

Front, back and in between, the PD8-6080 and PD8-6081 ProtEX-MAX Explosion-proof Modbus scanners boast specifications, features and functionality that make them the only hazardous area Modbus scanners you will ever need. They can scan up to 16 process variables made up of Modbus registers or two analog signals such as 4-20 mA. The PD8-6080 displays in decimal format, while the PD8-6081 displays in clearly marked feet & inches.

These Modbus scanners can be operated in Master, Slave or Snooper modes. In Master mode, the ProtEX-MAX reads up to 16 slave devices, scales the data from each, displays the result, and operates the internal relays and 4-20 mA output. As a Snooper, the scanners listen to the Modbus traffic and pick up a specific register or registers being polled by a master device from a specific slave device and process the data being read. In Slave mode, the scanner is controlled by a master device. The data sent to the scanner by the master is scaled, displayed, and used to operate the relays and 4-20 mA output.

The first thing you notice about the ProtEX-MAX is its modern looking, rugged, explosion-proof housing with convenient mounting flanges, available in aluminum or stainless steel. Housed inside this enclosure is a dual-line, 6-digit display with high-intensity LEDs that can be read in direct sunlight. The main line can display numbers up to 999,999 and the second line can be used to indicate a tag or display the input in another scale. The front panel push-buttons can even be operated in a hazardous area without removing the cover by using the CapTouch through-glass feature.

Various math functions may be applied to the Modbus and analog inputs as well as signal conditioning functions such as square root extraction, programmable exponent, or round horizontal tank calculations. The displays, relays, and the analog outputs may be assigned to PVs or to math channels C1, C2, C3, or C4. All these features and capabilities can easily be programmed without removing the cover using CapTouch buttons in a hazardous area or with free ScanView PC-based software in a safe area.

Modbus Capabilities

There are three operating modes for the Modbus scanners:

Master

Processes data read from Modbus RTU slave devices. It polls up to 16 process variables from 1 to 16 slave devices. The Master is capable of scanning the selected PVs, scaling the data, triggering relays, performing math operations, and driving the analog outputs.

Snooper

Listens to the Modbus traffic and picks up a specific register or registers being polled by a master device from a specific slave device and processes the data being read. The Snooper mode handles the data the same way as the Master.

Slave

Processes data sent to it from a Modbus RTU master device.

Possible applications include:

- Use Master Mode to scan the top level, interface level, and temperature from Modbus multivariable level transmitters.
- Use Master Mode to display the flow rate, tag, and units, for multiple Modbus-enabled flow meters.
- Use Snooper Mode to add a tank side indicator at eye-level for a Modbus level transmitter being polled by a master in the control room.
- Use Snooper Mode to add additional remote displays to a network with a Modbus scanner acting as the master and display the data at all operator locations.
- Use Slave Mode to display data sent to the scanner by a Modbus master in the control room.

Powerful Math Functions

The PD8-6080/81 uses up to 16 process variables in a variety of powerful math functions designed for process applications. Programmable Adder (P) and Factor (F) constants allow each formula to be customized as needed for a specific application. The Math Channels (C1-C4) may be displayed in many useful combinations. Most math functions may be applied to all PVs: for example, it is possible to add up to 16 PVs and calculate the total volume of all the tanks in a field. The Math2 function allows for further calculations on the results of other math channels (e.g. C4= C2/C1).

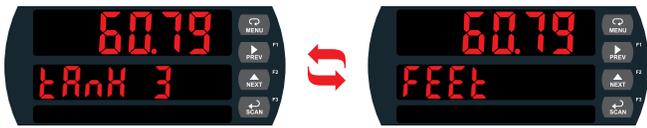
Name	Function	Setting
Addition	$C1=(PV1+PV2+P)*F$	5000
Difference	$C1=(PV1-PV2+P)*F$	dif
Absolute Difference	$C1=((Abs(PV1- PV2)+P)*F$	difABS
Average	$C1=(((PV1+PV2)/2)+P)*F$	AVG
Multiplication	$C1=((PV1*PV2)+P)*F$	multi
Division	$C1=((PV1/PV2)+P)*F$	div
Maximum PV	Maximum value of all selected PVs	Hi-Pv
Minimum PV	Minimum value of all selected PVs	Lo-Pv
Draw	$C1=((PV1/PV2)-1)*F$	drRat
Weighted Average	$C1=((PV2-PV1)*F)+PV1$	Wt. AVG
Ratio	$C1=(PV1/PV2)*F$	rRat
Concentration	$C1=(PV1/(PV1+PV2))*F$	ConcEn
Resultant Math Channel	Math on all other math channels	RRR2
Addition	$C3=(C1+C2+P)*F$	5000
Difference	$C4=(C1-C2+P)*F$	dif
Absolute Difference	$C3=((Abs(C1- C2)+P)*F$	difABS
Average	$C4=(((C1+C2)/2)+P)*F$	AVG
Multiplication	$C3=((C1*C2)+P)*F$	multi
Division	$C4=((C1/C2)+P)*F$	div

Note: The F constant can be any value from 0.00001 to 999999. If the value is less than 1, it will have the same effect as a divider. For example, the average could also be derived by using (A+B)*F, where F = 0.500.

ADVANCED DISPLAY FEATURES

Customizable Displays

The ProtEX-MAX has two red LED displays, a main display 0.60" (15 mm) high, and a second display 0.46" (12 mm) high. Each display is a full 6 digits (-99999 to 999999). The display assignment is programmable, allowing for various one line or two line PV configurations.



Alternating Tag and Units on Second Display for Each PV



Displaying Two PVs

Custom Tag and Units for Each PV

Each process variable has an independently programmable tag and unit name. The tag must display on the line opposite the PV or alternate with the PV during scanning. The unit may be configured to display similarly. The tag and unit may be programmed as any six-digit alphanumeric value.

Automatic or Manual Scanning

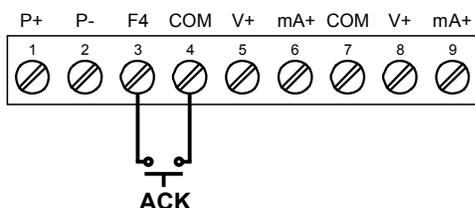
The scanner may automatically or manually cycle through the PVs. The scanner can be programmed to display each PV for 1 to 99.9 seconds. The NEXT and PREV buttons can be used to manually scan to the next or previous PV display. The SCAN button will pause and resume automatic scanning.

Function Keys

There are three front panel function keys, and a standard external digital input, which can be used as an external function "key" (F4). The external input is located on the rear signal connector (ground to trigger). The keys and external input trigger certain programmed events (i.e. acknowledge alarms, reset max and/or min, disable/enable output relays, and much more), provide direct menu access points, and more.

On-Board Digital Input

The PD8-6080/81 includes a digital input as a standard feature. This digital input can operate with the interlock relays feature, force relays on from a signal from a PLC or relay on other equipment, acknowledge alarms, and much more. This is ideal for installations where the scanner is inaccessible behind a cover, or where an additional function key is needed for customized operation.



Three Tier Password Protection

The PD8-6080/81 offers 3 levels of password protection:

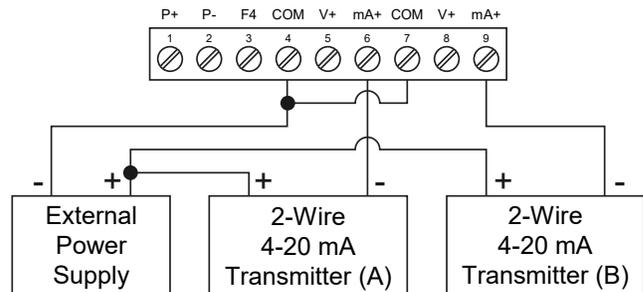
- Level 1 protection allows the operator use of only the 3 pre-configured function keys on the front panel without a password.
- Level 2 protection allows the operator use of only the function keys and the ability to change set points without a password.
- Level 3 protection restricts the operator from using the function keys and all scanner configuration menus without a password.

Advanced Linearization Capability

The PD8-6080/81 includes a 32-point linearizer for PV1 & PV2 (all other PVs utilize two-point linearization). In non-linear level applications (i.e. some pumping or lift stations), it can easily compensate for submerged equipment or plumbing that displace usable volume. In addition to the 32-point linearization, the ProtEX-MAX can perform a square root or programmable exponent function on one or both analog inputs, Modbus inputs, any or all enabled PVs, or automatically calculate level in round horizontal tanks by inputting the length and height of the tank. Each input's linearization is performed independently prior to the input value being used in any math function.

Dual Analog Input Scanning

The PD8-6080/81 has two process input channels (A & B) capable of accepting current (0-20, 4-20 mA) and voltage (± 10 , 0-5, 1-5, 0-10 VDC). Each input is programmed separately, with independent input type selection and scaling. These inputs may be displayed individually as part of the customizable dual-line display, or used with a wide range of math functions. Each input has a custom unit or tag that may be displayed. Each analog input enabled counts toward the available 16 PVs that may be scanned. The scanner could be configured to scan a maximum of 14 Modbus PVs, 4 math channels, and both analog inputs.



Rounding Feature for Even Steadier Display

The rounding feature is used to give the user a steadier display with fluctuating signals. It causes the display to round to the nearest value according to the rounding value selected (1, 2, 5, 10, 20, 50, or 100). For example, with a rounding value of 10, and an input of 123.45, the display would indicate 123.50.

QUICK & EASY SCALE & PROGRAMMING METHODS

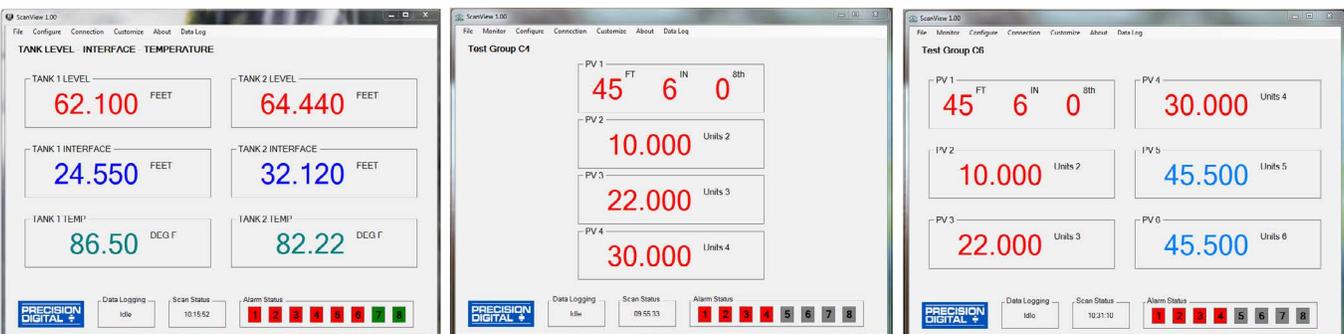
Given the nature of Modbus applications and the flexibility and feature-rich capabilities of the Modbus scanners, there is a considerable amount of programming required to get them going. Luckily, there is free PC-based software called ScanView that makes it very quick and easy to program the Modbus scanners. The scanners can also be programmed using the through-glass CapTouch buttons. This makes it easy to make small changes to the setup once the instrument is installed in the hazardous area. Once programming is completed, it can be locked with a password.

Free PC-Based ScanView USB Programming Software & Cable



The ProtEX-MAX comes preloaded with free **ScanView** 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. When you connect your ProtEX-MAX to your PC, ScanView is downloaded to your PC, the software automatically selects the model you are programming, and you're ready to start programming immediately.

Further simplifying the programming process, the ProtEX-MAX can be powered from the USB port, so no need to apply external power while programming your scanner. In addition to programming, the software will also allow you to monitor and datalog a ProtEX-MAX using your PC. You can also generate and save programming files for later use.



ScanView Monitoring



Once the scanner has been configured, the user chooses Monitor from the top menu bar. The Monitor window will appear; the enabled PVs and all associated values will take a few seconds to display.

The PVs will display as configured - either in Decimal or Feet & Inches format. Data Logging, Scanning, and Alarm Status can all be viewed at the bottom of the Monitor window.

ScanView Data Logging

ScanView software allows the user to log data and generate reports.

1. Select Monitor - Stop Scan from the top menu bar.
2. Select the Data Log drop-down menu from the top menu bar. Parameters for Data Logging are: Interval, Units, Log File Name, and Start/Pause. For Interval the choices are: 1-60, and for Unit choices for logging data are: Seconds, Minutes, and Hours.
3. Save the Data Log File. It is recommended to name the file using a unique name and the date, such as: "ScanView_1.00_Log_X_100813".
4. Select Monitor - Start Scan from the top menu bar, then select Data Log - Start from the top menu bar. The log file can be retrieved at any time by following the path: (C:) - Program Files (x86) - PDC - ScanView 1.00 - Data Log.

Note: Once Data Logging has begun, the Configure, Customize, and Connection screens cannot be accessed until the user has paused Data Logging.

Data Log files are saved in the Data Log folder as ".CSV" files. To view Data Log files, the user must first pause both Scanning and Data Logging. Data Logging & Scan Status can be seen at the bottom of the Monitor window.

CAPTOUCH THROUGH-GLASS BUTTONS

The ProtEX-MAX is equipped with four capacitive sensors that operate as through-glass buttons so that they can be operated without removing the cover (and exposing the electronics) in a hazardous area or harsh environment. CapTouch buttons are designed to protect against false triggering and can be disabled for security by selecting DISABLE on the switch labeled NO-CONTACT BUTTONS located on the connector board.

CapTouch Buttons

To actuate a button, press one finger to the window directly over the marked button area. When the cover is removed or replaced, the CapTouch buttons can be used after the scanner completes a self-calibrating routine. The sensors are disabled when more than one button is pressed, and they will automatically re-enable after a few seconds. When the cover is removed, the four mechanical buttons located on the right of the faceplate are used.

The CapTouch Buttons are configured by default to duplicate the function of the front panel mechanical pushbuttons associated with the integrated scanner.



Capacitive touch technology



More reliable & responsive



Operate scanner without removing the cover

OUTPUTS

Each output of the PD8-6080/81 may be assigned to a single analog input, Modbus PV, or math PV. The output will reflect the state of that assigned variable at all times during scanning.

Relay Outputs

The ProtEX-MAX is available with 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 ProtEX-MAX PD8-6080/81, 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 scales for any 4 mA and 20 mA display value. 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 (1-4) flash every 10 seconds indicating that the scanner is in manual control mode.

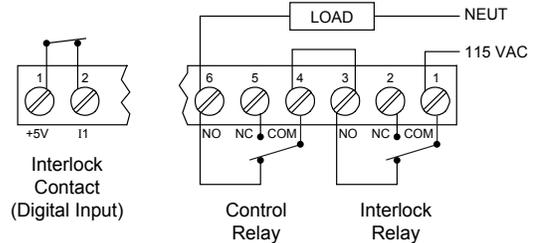


Sampling Function (PV Triggered Timed Relay)

The sampling function allows the operator to set a set point for a “sampling” relay. When the PV reaches that set point, it will close that relay’s contacts for a preset period of time (0.1 to 5999.9 seconds). An example of its use may be for beer/ale fermentation. When the batch reaches a certain pH, the relay contacts would close and alert someone or automatically take a sample of the batch. This function can be used whenever a timed relay output closure is required when the PV reaches a certain set point.

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.

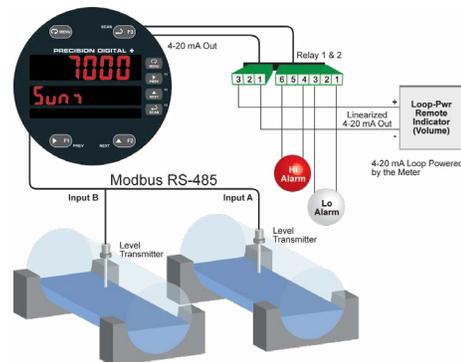


INPUT SIGNAL CONDITIONING

Non-linear input signals (i.e. weirs & flumes, differential pressure, etc.) can be linearized with the ProtEX-MAX’s simple to use built-in signal input conditioning, such as: square-root extractor, exponential linearizer, round horizontal tank linearizer, or the ProtEX-MAX powerful general purpose 32-point linearizer (32 point for for PV1 & PV2 only - all other PVs use two linearization points).



Weir Flow Calculated Using Exponential Signal Input Conditioning



Round Horizontal Tank Signal Input Conditioning

DIGITAL COMMUNICATIONS

Modbus® RTU Serial Communications

With onboard RS-485 serial communication, the PD8-6080/81 can communicate with any Modbus *master* device using the popular Modbus communications protocol that is included in every ProtEX-MAX. In addition to the typical Modbus capabilities of reading PVs and writing set points, below are some examples of other things that can be done with the scanner'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



Modbus PV Input



Remote Message

 [Click here for more information on the PROVu's Modbus capabilities](#)

Serial Adapters & Converters*



PDA7485-I
RS-232 to RS-422/485
Isolated Converter



PDA8485-I
USB to
RS-422/485
Isolated Converter

 For more info on serial converters click here.

*All adapters and connectors supplied with appropriate cables.

Integrated Digital I/O and Serial Communications



Digital I/O Connections

Four digital inputs and four digital outputs come standard with the ProtEX-MAX. External digital inputs can function similarly to the front panel function keys or 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), or provide a direct menu access point. The inputs can be connected to a multi-button control station to provide the user with remote control of the four front panel push buttons.

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

Note: The onboard digital inputs (1-4) are configured at the factory to function identically to the front panel pushbuttons (Menu, F1, F2, & F3) in order to work with the CapTouch buttons. Changing the programming of the digital inputs will affect the function of the CapTouch buttons.



Serial Communications Connections

ProtEX-MAX scanners come with an RS-485 connection for serial communications with other digital devices. The industry standard Modbus RTU protocol is included with every scanner.

PHYSICAL FEATURES

The ProtEX-MAX is designed for ease-of-use in safe and hazardous area applications, and is housed in a rugged NEMA 4X explosion-proof enclosure, available in either aluminum or stainless steel. The PD8-6080/81 can operate over a wide temperature range (-55 to 65°C / -67 to 149°F), includes removable screw terminal connectors, can have up to four relays and a 4-20 mA output, and features through-glass buttons for easy scanner operation without the need to remove the cover. All of these features are backed by a 3-year warranty.

Super-Bright LED Display

The ProtEX-MAX features a dual-line 6-digit display with super-bright LEDs, our brightest ever. These allow the display to be read in any lighting condition, even in direct sunlight.



CapTouch Through-Glass Buttons

The ProtEX-MAX is equipped with four capacitive sensors that operate as through-glass buttons so that it can be programmed and operated without removing the cover (and exposing the electronics) in a hazardous area. These buttons can be disabled for security by selecting the DISABLE setting on the NO-CONTACT BUTTONS switch located on the back of the electronics module, inside the enclosure.

Rugged Explosion-Proof Enclosure

The ProtEX-MAX is housed in a rugged NEMA 4X, 7, & 9, IP68 aluminum or stainless steel enclosure, designed to withstand harsh environments in safe and hazardous areas.



Wide Viewing Angle

Customers can't always look at the display from straight on, so the window and display module have been optimized to provide a wide viewing angle of approximately $\pm 40^\circ$; nearly twice that of the competition.



Built-In Mounting Flanges

The ProtEX-MAX is equipped with two slotted flanges for wall mounting or NPS 1½" to 2½" or DN 40 to 65 mm pipe mounting.



Flexible Mounting & Wiring

The ProtEX-MAX features four ¾" NPT threaded conduit openings so that wiring can be routed to the most convenient conduit connection(s).



Rotatable Display

The ProtEX-MAX rotatable display, along with four available conduit connections, provide for numerous installation options. The display can be rotated in 90° increments. Rotate it 90° for horizontal mounting.



Vertical Mounting



Horizontal Mounting

Perfect & Secure Fit Every Time

The internal cast rails ensure the ProtEX-MAX assembles together perfectly, quickly and securely; and everything lines up for optimal viewing every time. There are no standoffs to worry about breaking or getting out of alignment. The display module snaps into the built-in rails on the enclosure making assembly a snap, while pressing the display as close to the glass as possible to improve wide angle viewing. No tools are needed to install or remove it.

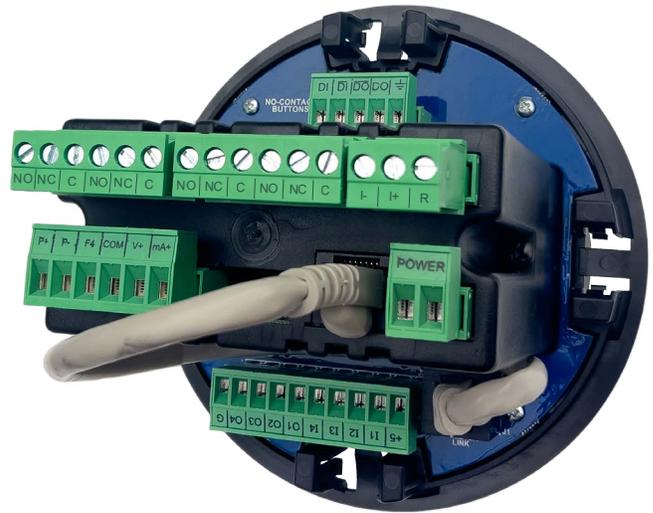
PDA-SSTAG Stainless Steel Tags

PDA-SSTAG is a laser etched stainless steel tag accessory for any Precision Digital scanner. The tag features custom text for equipment identification, instruction, or whatever else is needed in your facility. Each tag comes with a stainless steel wire and lead seal for easy mounting wherever you need it.



Removable Screw Terminal Connectors

Industrial applications require screw terminal connections for easy field wiring and the ProtEX-MAX goes one step further in convenience by also making them removable.



Note: The above photograph is representative of the back of the PD8-6080 and PD8-6081 in every regard except for the signal input connector. See page 16 for connection drawings.

USB Port ScanView



Hazardous Area Certification

The ProtEX-MAX is certified by CSA as Explosion-Proof / Dust-Ignition-Proof / Flame-Proof and is approved by ATEX and IECEx as Dust-Ignition-Proof / Flame-Proof.

Wide Operating Temperature Range

The ProtEX-MAX can operate from -55 to 65°C (-67 to 149°F) meaning it can be installed in a wide variety of indoor and outdoor industrial applications.

ACCESSORIES

PD9501 Multi-Function Calibrator



This PD9501 Multi-Function Calibrator has a variety of signal measurement and output functions, including voltage, current, thermocouple, and RTD.

Model	Description
PD9501	Multi-Function Calibrator

PD9502 Low-Cost Signal Generator



The PD9502 is a low-cost, compact, simple to use 4-20 mA or 0-10 VDC signal generator. It can easily be set for 0-20 mA, 4-20 mA, 0-10 V or 2-10 V ranges. Signal adjustment is made with a one-turn knob. A 15-27 VDC wall plug is provided with the instrument. Optional USB power bank is available.

Model	Description
PD9502	Low-Cost Signal Generator

⚠ WARNING

- These accessories do not carry hazardous area approvals and are thus not suitable for location in hazardous areas. The use of additional protective devices may allow them to be installed in a safe area and connected to a device in a hazardous area. User should consult a professional engineer to determine suitability of these products for their specific application.

Complete Product Line of Displays and Controllers IN ALL SHAPES, SIZES & LOCATIONS



Big, Bright Displays
For Indoor or Outdoor
in Bright Sunlight



Large Dual-Line
6-Digit Display



24 VDC
Transmitter
Power Supply



MeterView® Pro USB
Programming Software



Universal 85-265
VAC or 12-24 VDC
Input Power
Options



4-20 mA, 0-10 V,
Thermocouple, RTD,
Strain Gauge, High
Voltage, & Modbus Inputs



Up To Four
3 A Form C
Relays (SPDT)



SP Ex IECEx CE

EXPLOSION-PROOF ProtEX-MAX Series

- NEMA 4X, IP68 Rated Enclosure
- CapTouch Through-Glass Buttons
- Operating Temperature of -55 to 65°C
- Worldwide Approvals

LARGE DISPLAYS Helios Series

- 1.8" Digits Readable From 100 Feet
- NEMA 4X, IP65 Rated Enclosure
- Operating Temperature of -40 to 65°C
- Now UL and C-UL Approved!

UL CE

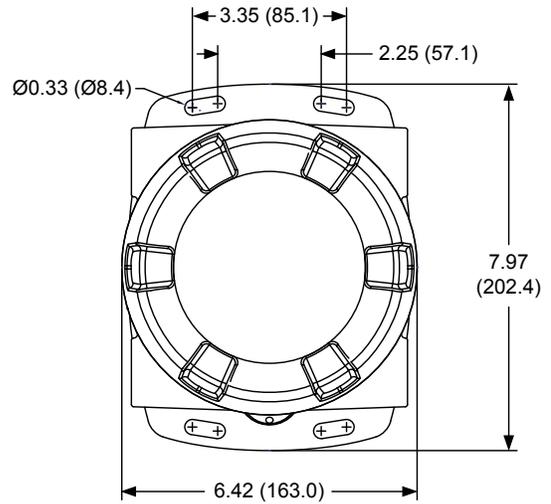
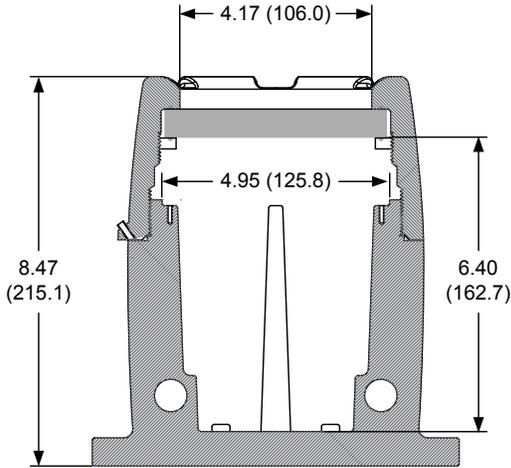
PANEL METERS ProVu Series

- NEMA 4X, IP65 Rated Front
- Programmable Function Keys
- UL, C-UL, and CE Approvals
- 1/8 DIN Size

Go to PREDIG.COM for details on ProVu, ProtEX-MAX and Helios Series Meters

DIMENSIONS

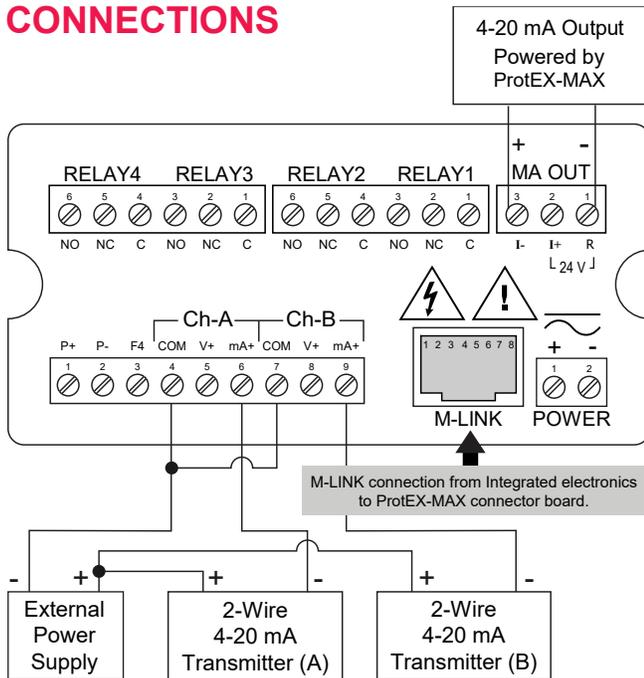
Units: Inches (mm)



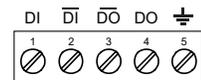
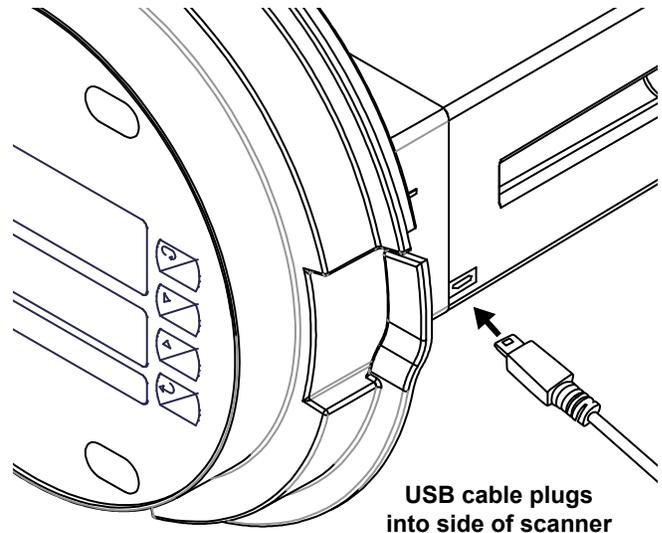
Download free 3-D CAD files of these instruments to simplify your drawings!

predig.com/documentation-cad

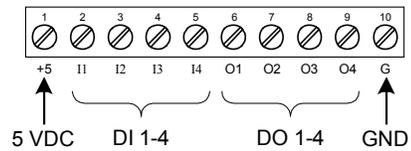
CONNECTIONS



Connections for PD8-6080/81-6H7 and PD8-6080/81-7H7



RS-485 Connections



Digital I/O Connections

SPECIFICATIONS

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

General

Input/Output	Modbus RTU over RS-485 Two analog inputs (4-20 mA, ±10 V)
Display	Display Line 1: 0.60" (15 mm) high, red LEDs Display Line 2: 0.46" (12 mm) high, red LEDs 6 digits each (-99999 to 999999), with lead zero blanking
Feet & Inches Range (PD8-6081)	-9 ^{FT} 11 ^{IN} (¹⁵ / ₁₆ or ⁷ / ₈) to 99 ^{FT} 11 ^{IN} (¹⁵ / ₁₆ or ⁷ / ₈)
Display Intensity	Eight user selectable intensity levels. Default intensity is six.
Display Update Rate	5/second (200 ms)
Overrange	Display flashes 999999
Underrange	Display flashes -999999
Programming Methods	Four CapTouch through-glass buttons when cover is installed. Mechanical buttons can be used with the cover removed. Free PC-based USB ScanView programming software.
Max/Min Display	Max/min readings are stored until reset by the user or when power to the scanner is turned off. User can reset by front panel pushbuttons, digital input, or via Modbus registers.
Rounding	Select 1, 2, 5, 10, 20, 50, or 100 (e.g. rounding = 10, value = 123.45, display = 123.50)
Password	Three programmable passwords restrict modification of programmed settings. Pass 1: Allows use of function keys and digital inputs Pass 2: Allows use of function keys, digital inputs and editing set/reset points Pass 3: Restricts all programming, function keys, and digital inputs
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; 12-24 VDC, 12-24 VAC, 15 W max. Powered over USB for configuration only.
Fuse	Required external fuse: UL Recognized, 5 A max, slow blow; up to 6 scanners may share one 5 A fuse
Isolation	4 kV input/output-to-power line 500 V input-to-output or output-to-P+ supply
Overvoltage Category	Installation Overvoltage Category II: Local level with smaller transient overvoltages than Installation Overvoltage Category III.

Environmental	T6 Class operating temperature range Ta = -55 to 60°C T5 Class operating temperature range Ta = -55 to 65°C Storage temperature range: -55 to 85°C (-67 to 185°F) Relative humidity: 0 to 90% non-condensing
Max Power Dissipation	Maximum power dissipation limited to 13.73 W
Connections	Power, signal, relays, mA out: Removable screw terminal blocks accept 12 to 22 AWG wire RS-485: Removable screw terminal block accepts 16 to 30 AWG wire Digital I/O: Removable screw terminal blocks accept 16 to 30 AWG wire
Mounting	Wall Mounting: Four (4) mounting holes provided for mounting scanner to wall. Pipe Mounting: Optional pipe mounting kit (PDA6848) allows for pipe mounting. Sold separately.
Tightening Torque	Power, signal, relays, mA out terminals: 5 lb-in (0.56 Nm) Digital I/O and RS-485: 2.2 lb-in (0.25 Nm)
Overall Dimensions	6.4" x 8.0" x 8.5" (163 mm x 202 mm x 215 mm) (W x H x D)
Weight	AL: 14.7 lbs (6.7 kg) SS: 23.5 lbs (10.7 kg)
Warranty	3 years parts & labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Operating Modes

Master	Processes data read from Modbus RTU slave devices. It polls up to 16 process variables from 1 to 16 slave devices. The Master is capable of scanning the selected PVs, scaling the data, triggering relays, performing math operations, and driving the analog outputs.
Snooper	Listens to the Modbus traffic and picks up a specific register or registers being polled by a master device from a specific slave device and processes the data being read. The Snooper mode handles the data the same way as the Master.
Slave	Processes data sent to it from a Modbus RTU master device.
Note:	The relays and the 4-20 mA outputs are functional in all modes.

Master & Snooper Settings

PV Number	PV1–PV16 Enable or disable the process variables to be polled by the Master.
Slave Id	Assign the slave ID or address (1-247, 256-259 for mA or volts inputs) containing the process variables to be displayed by the selected PV.
Function Code	Select which Modbus function code (03, 04, or 65) to use in reading the slave device.
Register Number	5 digit: 30001-39999, 40001-49999, or 1-65,536 6 digit: 300001-365536 or 400001-465536 (Function Code 65 N/A here) Specifies which register(s) to read in the slave device. Range is dependent on Function Code selection (65, 04, or 03) and digits selection (5 or 6).
Data Type	Select the data format that the slave device uses. Select between Short integer (2 byte), Long integer (4 byte), or floating point (4 byte), Signed or Unsigned (integer only) and byte order: 1234, 4321, 2143, or 3412 (big-endian vs. little-endian, or swapped).
Poll Time	1.0 to 99.9 sec. Time between read-commands (Master mode).
Slave Response Timeout	0.0 to 99.9 seconds: Time allowed for the slave to respond before the scanner generates a communication break condition. The master polls the slave 3 times before starting the response timeout timer. Slave/Snooper mode: Time the scanner will wait for new data before going into break condition. Slave mode: Programming 0 disables the timeout; the last value received will be displayed indefinitely.
Communication Break	Displays <i>b r E R H</i> after the Master has polled the slave device 3 times and the response timeout has elapsed. The Snooper and Slave modes go into break condition after no new data is received within the response timeout window. Relays can be programmed to go on, off, or ignore the break condition. The analog outputs can be setup to generate a fixed mA current when a break condition is detected.

PV Settings

Scan Mode	Automatic: 1.0 to 99.9 sec Manual: Front panel or digital inputs Go on alarm: Continues scanning after an alarm is detected Stop on alarm: Goes to the alarmed PV and stops scanning; press Scan to resume scanning.
Display Scan Rate	Master/Snooper: 1 PV/second to 1 PV every 99.9 seconds Slave: Dependent on master device (e.g. PLC) Note: The display scan rate is independent of the poll time.
Display Assignment	Display line 1: PV, Ch-C (math channel), PV & units, tag & PV, tag-PV-units, Ch-C & units, tag-Ch-C-unit, set points, max/min PV, max/min Ch-C Display line 2: Same as Display Line 1; plus units, tag or turned off The tag and units are displayed alternately for 2 seconds max, when selected. Different tags & PVs may be selected to display on line 1 & 2 at the same time

Display Settings

Tag & Units	6-character, independent tag and units for each PV and math channel
PV Format	PD8-6080 default: Decimal format PD8-6081 default: FT & IN, 1/8th or 1/16th; decimal format may be selected for line 2 indication.
Display Decimal Point	Up to five decimal places or none: <i>dddddd, dddddd, dddddd, dddddd, dddddd, or dddddd</i>
Float Decimal Point	Select the number of decimals to use for the floating point data expected from the slave or master device (this is independent from the display decimal point selection).
PV & Math Scaling	All PVs and math channels may be scaled to represent the input data in any engineering unit. Example: Level transmitter = 999.999 inches; to display in Ft-In-1/16th scale input 2 to display 83 Ft – 4 In – 0/16th.

Math Functions

Name	Math Operation (Examples) (P = Adder, F = Factor)	Setting
Addition	$(PV1+PV2+P)*F$	5000
Difference	$(PV1-PV2+P)*F$	0.1
Absolute difference	$((Abs(PV1- PV2)+P)*F$	0.1Rb5
Average	$((PV1+PV2)/2)+P)*F$	0.5
Multiplication	$((PV1*PV2)+P)*F$	0.001
Division	$((PV1/PV2)+P)*F$	0.001
Max PV	Max value of all selected PVs	0.1-0.5
Min PV	Min value of all selected PVs	0.1-0.5
Draw	$((PV1/PV2)-1)*F$	0.1
Weighted average	$((PV2-PV1)*F)+PV1$	0.1
Ratio	$(PV1/PV2)*F$	0.1
Concentration	$(PV1/((PV1+PV2))*F$	0.1
Math 2	Math on other math channels	0.1
Programmable Constants	Constant P (Adder): -99.999 to 999.999, default: 0.000 Constant F (Factor): 0.001 to 999.999, default: 1.000	

Serial Communications

Compatibility	EIA-485
Connectors	Removable screw terminal connector
Max Distance	3,937' (1,200 m) max
Status Indication	Separate LEDs for Power (P), Transmit (TX), and Receive (RX)
Scanner ID	1 – 247 (Scanner Modbus address)
Baud Rate	300 – 19,200 bps
Transmit Time Delay	Programmable 0 to 4999 ms This is the time the scanner will wait for a slave to respond before sending another request on the bus. This value should be greater than 100 ms to avoid collisions on the bus.
Data	8 bits (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 second
Turn Around Delay	Less than 2 ms (fixed)

Note: Refer to the ProtEX-MAX Scanner Modbus Register Tables located at www.predig.com for details.

Dual Process Inputs

Two Inputs	Two non-isolated analog inputs, independent field selectable: 0-20 mA, 4-20 mA; ±10 V (0-5, 1-5, 0-10 V)
Isolated Transmitter Power Supply	Terminals P+ & P-: 24 VDC ± 10%. Isolated from the input at >500 V and from the power line at 4 kV. Jumper selectable for 24, 10, or 5 VDC supply (internal jumper J4). All models transmitter supply rated @ 25 mA max.
PV Analog Channel ID	Ch-A mA: Assign PV to ID 256 or Ch-A volt: 257; Ch-B mA: Assign PV to ID 258 or Ch-B volt: 259
Accuracy	±0.03% of calibrated span ±1 count, square root & programmable exponent accuracy range: 10-100% of calibrated span
Temperature Drift	0.005% of calibrated span/°C max from 0 to 65°C ambient, 0.01% of calibrated span/°C max from -40 to 0°C ambient
Input Signal Conditioning	Linear, square root, programmable exponent, or round horizontal tank volume calculation
Multi-Point Linearization	2 to 32 points for PV1 and PV2
Programmable Exponent	User selectable from 1.0001 to 2.9999 for open channel flow
Round Horizontal Tank	Diameter & Length: 999.999 inch or cm calculates volume in gallons or liters respectively.
Low-value Cutoff	0.1 to 999.999 (0 disables cutoff function) for PV1 and PV2. Point below at which display always shows zero.
Calibration Range	Input Range Minimum Span 4-20 mA 0.15 mA ±10 V 0.10 V
Input Impedance	An error message will appear if the input 1 and input 2 signals are too close together. Voltage ranges: greater than 500 kΩ Current ranges: 50 - 100 Ω (depending on internal resettable fuse impedance)
Input Overload	Current input protected by an internal resettable fuse, 30 VDC max. Fuse resets automatically after fault is removed.
HART Transparency	The scanner does not interfere with existing HART communications; it displays the 4-20 mA primary variable and it allows the HART communications to pass through without interruption. The scanner is not affected if a HART communicator is connected to the loop. The scanner does not display secondary HART variables.

Relays

Rating	Rating: 4 SPDT (Form C) internal and rated 3 A @ 30 VDC and 125/250 VAC resistive load, Total current: 4 A max (total of all relays), 1/14 HP (≈ 50 W) @ 125/250 VAC for inductive loads
Noise Suppression	Noise suppression is recommended for each relay contact switching inductive loads.
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 (turn off).
Relay Operation	<ul style="list-style-type: none"> • Automatic (non-latching) and/or manual reset • Latching (requires manual acknowledge) with or without clear • Pump alternation control (2-4 relays) • Sampling (based on set point and time) • Off (disable unused relays and enable Interlock feature) • Manual on/off control mode
Relay Reset (Acknowledge)	User selectable via front panel button, F4 digital input, external contact closure on digital inputs, automatically via user selectable preset value and time delay, or through serial communications.
Time Delay	0 to 999.9 seconds, on & off relay time delays. Programmable and independent for each relay
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 alarm state.
Auto Initialization	When power is applied to the scanner, relays will reflect the state of the input to the scanner.

Isolated 4-20 mA Transmitter Output

Output Source	PV1-16, math channels C1-4, set points 1-4, 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 Out Programming	23.000 mA maximum for all parameters: Overrange, underrange, max, min, and break									
Communications Break	Programmable mA output when a slave device does not reply within the response timeout.									
Accuracy	± 0.1% of span ± 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%. Used to power the 4-20 mA output. All models rated @ 25 mA max									
External Loop Power Supply	35 VDC maximum									
Output Loop Resistance	<table border="1"> <thead> <tr> <th>Power Supply</th> <th>Minimum</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>24 VDC 10 Ω</td> <td>700 Ω</td> <td></td> </tr> <tr> <td>35 VDC (external)</td> <td>100 Ω</td> <td>1200 Ω</td> </tr> </tbody> </table>	Power Supply	Minimum	Maximum	24 VDC 10 Ω	700 Ω		35 VDC (external)	100 Ω	1200 Ω
Power Supply	Minimum	Maximum								
24 VDC 10 Ω	700 Ω									
35 VDC (external)	100 Ω	1200 Ω								

USB Connection

Function	Programming only
Compatibility	USB 2.0 Standard, Compliant
Connector Type	Micro-B receptacle
Cable	USB A Male to Micro-B Cable
Driver	Microsoft® Windows® 10/11
Power	USB port provides power to the scanner. DO NOT apply AC or DC power to the scanner while the USB port is in use.

Digital Input (F4)

Function	Remote operation of front-panel buttons, acknowledge/reset relays, reset max/min values.
Contacts	3.3 VDC on contact. Connect normally open contacts across F4 to COM
Logic Levels	Logic High: 3 to 5 VDC Logic Low: 0 to 1.25 VDC

Digital Inputs & Outputs

Function	Terminals provided for remote operation of all four programming / operation buttons. Other uses include acknowledge/reset relays and reset max/min values.
Channels	5 digital inputs & 4 digital outputs
Digital Input Logic High	3 to 5 VDC
Digital Input Logic Low	0 to 1.25 VDC
Digital Output Logic High	3.1 to 3.3 VDC
Digital Output Logic Low	0 to 0.4 VDC
Source Current	10 mA maximum output current
Sink Current	1.5 mA minimum input current
+5 V Terminal	To be used as pull-up for digital inputs only. Connect normally open push buttons across +5 V & DI 1-4.

WARNING

- **DO NOT** use +5 V terminal to power external devices.

ScanView Software

Availability	Download directly from scanner or from www.predig.com/download_software
System Requirements	Microsoft® Windows® 10/11 USB 2.0 (for programming only)
Communications	USB 2.0 (for programming only) (USB A Male to Micro-B Cable) RS-485 to USB converter (programming, monitoring, and data logging)
Configuration	Configure scanners one at a time
Power	USB port provides power to the scanner. DO NOT apply AC or DC power to the scanner while the USB port is in use.

Enclosure

Material	AL Models: ASTM A413 LM6 die-cast aluminum, copper-free, enamel coated SS Models: ASTM A743 CF8M investment-cast 316 stainless steel
Gasket	Fluoroelastomer
Rating	NEMA 4X, IP68 Explosion-proof
Color	AL: Blue SS: Silver
Window	Borosilicate glass
Conduits	Four 3/4" NPT threaded conduit openings
Conduit Stopping Plugs	Sold separately
Flanges	Two built-in flanges for wall and pipe mounting
Tamper-Proof Seal	Cover may be secured with tamper-proof seal
Overall Dimensions	6.4" x 8.0" x 8.5" (163 mm x 202 mm x 215 mm) (W x H x D)
Weight	AL: 14.7 lbs (6.7 kg) SS: 23.5 lbs (10.7 kg)
ATEX	Ⓔ II 2 G D Ex db IIC Gb Ex tb IIIC Db IP66/IP68 Tamb: -55°C to +85°C Certificate No.: Sira 19ATEX1252U
IECEX	Ex db IIC Gb Ex tb IIIC Db IP66/IP68 Tamb: -55°C to +85°C Certificate No.: IECEX SIR 19.0075U
CSA	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Group E, F, G Class III Ex db IIC Gb Ex tb IIIC Db Class I, Zone 1, AEx db IIC Gb Zone 21, AEx tb IIIC Db IP66/IP68/TYPE 4X Tamb: -55°C to +85°C Certificate No.: CSA19.80011200U
UL	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III Class I, Zone 1, AEx db IIC Gb Zone 21, AEx tb IIIC Db Ex db IIC Gb Ex tb IIIC Db IP66/IP68/TYPE 4X Tamb: -55°C to +85°C Certificate Number: E518920

Note: The above approvals are for the enclosure only. See next page for approvals on the entire instrument.

General Compliance Information

Electromagnetic Compatibility

Emissions	EN 55022 Class A ITE emissions requirements
Radiated Emissions	Class A
AC Mains Conducted Emissions	Class A
Immunity	EN 61326-1 Measurement, control, and laboratory equipment EN 61000-6-2 EMC heavy industrial generic immunity standard
RFI - Amplitude Modulated	80 -1000 MHz 10 V/m 80% AM (1 kHz) 1.4 - 2.0 GHz 3 V/m 80% AM (1 kHz) 2.0 - 2.7 GHz 1 V/m 80% AM (1 kHz)
Electrical Fast Transients	±2kV AC mains, ±1kV other
Electrostatic Discharge	±4kV contact, ±8kV air
RFI - Conducted	10V, 0.15-80 MHz, 1kHz 80% AM
AC Surge	±2kV Common, ±1kV Differential
Surge	1KV (CM)
Power-Frequency Magnetic Field	30 A/m 70%V for 0.5 period
Voltage Dips	40%V for 5 & 50 periods 70%V for 25 periods
Voltage Interruptions	<5%V for 250 periods

Note: Testing was conducted on meters with cable shields grounded at the point of entry representing installations designed to optimize EMC performance.

Product Ratings and Approvals

CSA	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1, T5 Class III, Division 1, T6 (Ta max = 60°C) Ex db IIC T5 Ex db IIC T6 (Ta max = 60°C) Ex tb IIIC T90°C Ta = -55°C to +65°C Enclosure: Type 4X & IP66 / IP68 CSA Certificate: CSA 12 2531731
ATEX	II 2 G D Ex db IIC T* Gb Ex tb IIIC T90°C Db IP68 Ta = -55°C to +*°C *T6 = -55°C to +60°C *T5 = -55°C to +65°C Certificate Number: Sira 12ATEX1182X
IECEX	Ex db IIC T* Gb Ex tb IIIC T90°C Db IP68 Ta = -55°C to +*°C *T6 = -55°C to +60°C *T5 = -55°C to +65°C Certificate Number: IECEX SIR 12.0073X

ATEX/IECEX Specific Conditions of Use:

- The equipment label and epoxy coating may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.
- Flameproof joints are not intended to be repaired.
- All entry closure devices shall be suitably certified as "Ex d", "Ex t" and "IP66/68" as applicable. Suitable thread sealing compound (non-setting, non-insulating, non-corrosive, not solvent based, suitable for the ambient rating) must be used at the NPT conduit entries to achieve the IPx8 rating while maintaining the Ex protection concept.

Year of Construction

This information is contained within the serial number with the first four digits representing the year and month in the YYMM format.

For European Community

The ProtEX-MAX must be installed in accordance with the ATEX directive 2014/34/EU, the product manual, and the product certificate Sira 12ATEX1182X.

ORDERING INFORMATION

PD8-6080 Decimal Modbus Scanner • Aluminum Enclosure		
85-265 VAC Model	12-24 VDC Model	Options Installed
PD8-6080-6H0	PD8-6080-7H0	None
PD8-6080-6H7	PD8-6080-7H7	4 Relays & 4-20 mA Output

PD8-6080 Decimal Modbus Scanner • Stainless Steel Enclosure		
85-265 VAC Model	12-24 VDC Model	Options Installed
PD8-6080-6H0-SS	PD8-6080-7H0-SS	None
PD8-6080-6H7-SS	PD8-6080-7H7-SS	4 Relays & 4-20 mA Output

PD8-6081 F&I Modbus Scanner • Aluminum Enclosure		
85-265 VAC Model	12-24 VDC Model	Options Installed
PD8-6081-6H0	PD8-6081-7H0	None
PD8-6081-6H7	PD8-6081-7H7	4 Relays & 4-20 mA Output

PD8-6081 F&I Modbus Scanner • Stainless Steel Enclosure		
85-265 VAC Model	12-24 VDC Model	Options Installed
PD8-6081-6H0-SS	PD8-6081-7H0-SS	None
PD8-6081-6H7-SS	PD8-6081-7H7-SS	4 Relays & 4-20 mA Output

Note: 24 V flowmeter power supply standard on all models.

Accessories	
Model	Description
PDAPLUG75	3/4" NPT 316 Stainless Steel Stopping Plug with Approvals
PDA-SSTAG	Stainless Steel Tag
PDA6848-SS	Pipe Mounting Kit Stainless Steel
PDA7485-I	RS-232 to RS-422/485 Isolated Converter
PDA8485-I	USB to RS-422/485 Isolated Converter

WARNING

Cancer and Reproductive Harm - www.P65Warnings.ca.gov

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