
External Display 420

User manual

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1 Warning - Read this first

	<p>Do not open the device. Our instruments are assembled with high precision. Opening this device is dangerous and may destroy the instrument. Warranty is voided when you open the instrument.</p>
	<p>Feedback leads to product improvement. Please share your experience with us, as we are continuously improving our products in our commitment to quality, reliability and ease of use. Let us know via sales@vpinstruments.com!</p>

2 Introduction

The VPInstruments powered loop displays can be used to visualize any 4 .. 20 mA sensor output. The display will be powered from the current loop so no external power supply is required.

Two models are available:

- VPA.8000.1512
- VPA.8000.1513 (with 2 alarm relays)

Both models are IP67 protected field enclosure models. All models are loop powered LED displays and all required power is supplied by the 4 .. 20 mA loop. This enables cost efficient placement in locations where a separate power supply is not available. The display scaling, the alarm levels and all other settings can be controlled via the front panel. When using more than one decimal the display can be soothed with the digital filter. Device configuration can be protected with a password. The keyboard can be disabled by removing a jumper. The alarm function is for applications where alarm limits rarely change. The alarm relays cannot pull simultaneously with less than an 8 mA loop current, so typically either a high alarm and a low alarm or two high alarm configurations are used.

3 Product overview

LED lights

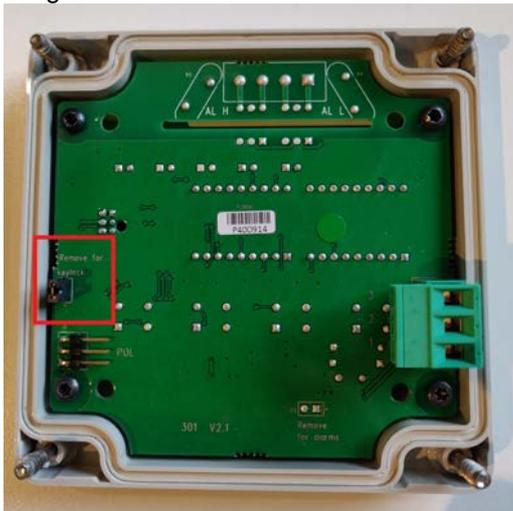
LED	Function
A1	Alarm 1 on
A2	Alarm 2 on
M1	Not in use
M2	Not in use
Conf	Configuration state on

Restore default settings and remove configuration code

Press and hold * and > for 2 seconds while switching power on.

Keyboard lock

The keyboard lock prevents unauthorized or accidental use of the keyboard. To enable the keyboard lock, remove the jumper from the "Remove for keylock" jumper header. The jumper is marked on the image below

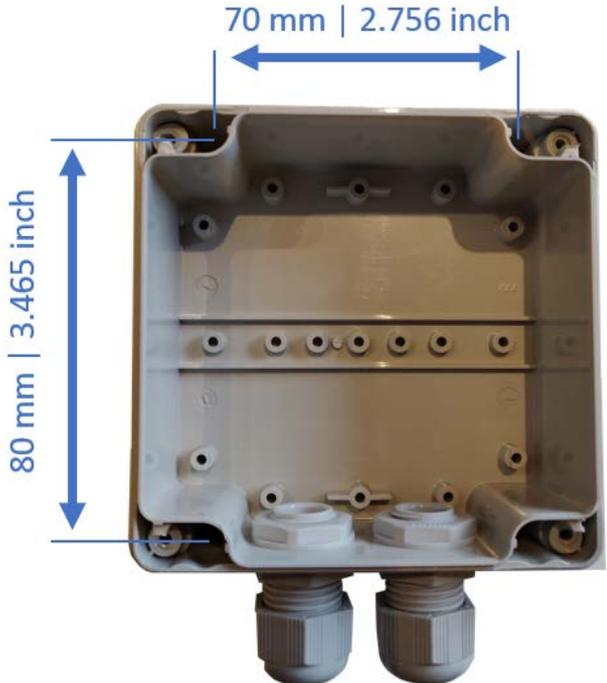


Empty space on the right side of the front panel

This is space for a unit sticker. A sticker sheet is supplied with the device.

4 Mechanical installation

First select the right installation point. Follow the next six steps for installation.

<p>1. Remove the four screws and open the cover</p>	
<p>3. Hold the display at the preferred position on the wall and mark the four installation holes with a pencil</p>	
<p>4. Lay the display aside and drill the marked points</p>	
<p>5. Insert a jack in each hole</p>	
<p>6. Hold the display in front of the drilled holes and screw it through the connection holes to the wall</p>	



Do not install the display upside down



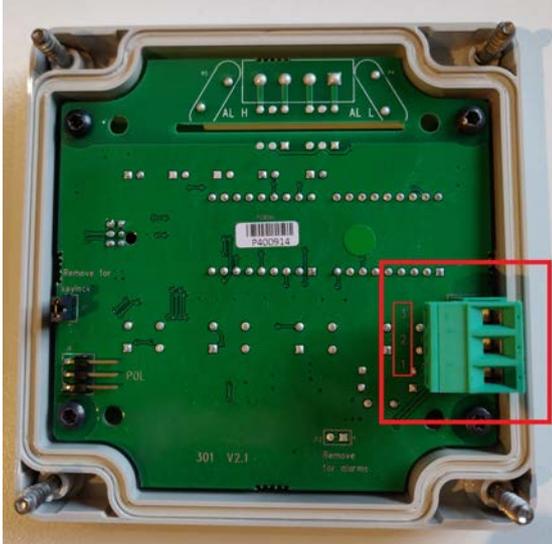
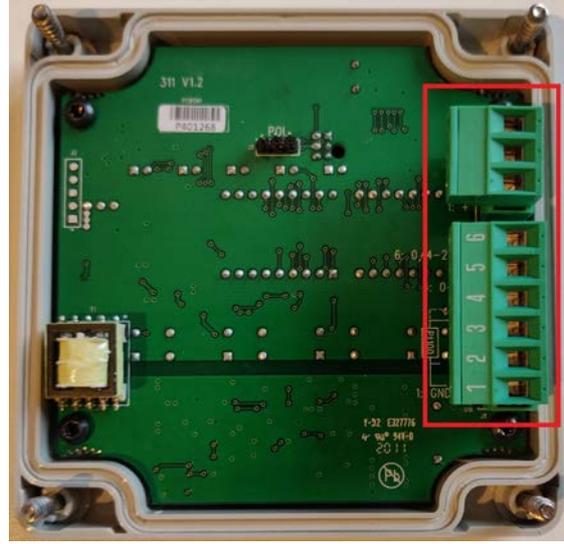
Do not install the display in an environment where fluids can leak onto the device



Do not drill through the installation holes, use a pencil to mark the position holes and drill afterwards

5 Electrical connections

The connectors for connecting the 4..20mA signal and alarms are located inside the box. Below image shows the connectors for both types

Without alarm relays	With alarm relays
	
<p>Pin 1 4..20mA + Pin 2 4..20mA - Pin 3 Not used</p>	<p>Top connector Pin 1 4..20mA + Pin 2 4..20mA - Pin 3 Not used</p> <p>Lower connector Pin 1 Alarm output A2 Pin 2 Not used Pin 3 Alarm output A2 Pin 4 Alarm output A1 Pin 5 Not used Pin 6 Alarm output A1</p>

6 Configuration

6.1 Scaling

Scaling is required to transform the 4 .. 20 mA in human readable values. The low(zero) and high(span) need to be set according to the sensor's measurement range.

Example

VP Dew Point Sensor	
Measurement range	-70 to +60 deg C
Low (zero)	-70
High (span)	+60

Set the Lo display value using the keyboard. This is displayed with a 4mA current. Default is 0.0

1. Press and hold * and ^ for two seconds. The Conf LED will light up
2. Press v five times to move to the Lo setting
3. Press > to enter the Lo setting
4. To change numbers, press > to select and change with ^ and v
5. To move the decimal point, first select it with >, then move it with ^ and v
6. When the Lo setting is at the desired value, press *

Next set the Hi display value using the keyboard. This is displayed with a 20mA current. Default is 100.0

1. Press v to move to the Hi setting
2. Press > to enter the Hi setting
3. To change numbers, press > to select and change with ^ and v
4. To move the decimal point, first select it with >, then move it with ^ and v
5. When the Hi setting is at the desired value, press *

Press * and > to save. The Conf LED will turn off. The device is now ready for use.

6.2 Alarm

Follow below steps to configure the alarms:

1. Press and hold * and ^ for two seconds. The Conf LED will light up
2. Press > to enter the AL L setting
3. To change numbers, press > to select and change with ^ and v
4. When the AL L setting is at the desired value for the low alarm, press *
5. Press v to move to the HY L setting
6. Press > to enter the HY L setting
7. Press ^ to change the minus sign to 0 to enable the alarm function
8. To enter a bigger hysteresis, press > and make a change with ^
9. When the HY L setting is at the desired value for hysteresis, press *
10. Press v to move to the AL H setting
11. Press > to enter the AL H setting
12. To change numbers, press > to select and change with ^ and v
13. To move the decimal point, first select it with >, then move it with ^ and v
14. When the AL H setting is at the desired value for the low alarm, press *
15. Press v to move to the HY H setting
16. Press > to enter the HY H setting
17. Press ^ to change the minus sign to 0 to enable the alarm function
18. To enter a bigger hysteresis, press > and make a change with ^
19. When the HY H setting is at the desired value for hysteresis, press *

Press * and > to save. The Conf LED will turn off. The alarms are now ready for use.

AL L (Alarm Low)

The A1 relay will activate when the display value goes below this setting (when ALCF=LoHI) or above it (when ALCF=HIHI). Both alarms cannot be active simultaneously. Alarm low must not be set higher than alarm high. If the input current falls below 3 mA, the alarm relays are disabled automatically, because the available power is not sufficient for the relays. Default is 20.0.

HY L (Hysteresis Low)

Hysteresis prevents relays from changing their state needlessly when the display value fluctuates near the alarm level. The alarm is deactivated when the display value moves away from the alarm level by the value of HY L. For example if AL H = 20 and HY L = 5, the alarm is activated when the display value is 80 and is deactivated when the display value is 15. A keyboard alarm reset can be enabled by setting the hysteresis higher than the scaled range (for example 9999). This way the alarm stays on waiting for a v key press or for the display value to decrease under the alarm level. The alarm is then switched off because both relays cannot be active simultaneously. Alarm can be disabled completely by changing this setting to a negative value. This will however not reduce voltage drop. For models 201, 301 and 305 the default is -1.0. For 202 and 302, the default is 1.0.

AL H (Alarm High)

The A2 relay will activate when the display value goes above this setting. Both alarms cannot be active simultaneously. Alarm low must not be set higher than alarm high. Default is 80.0.

HY H (Hysteresis Low)

Hysteresis prevents relays from changing their state needlessly when the display value fluctuates near the alarm level. The alarm is deactivated when the display value moves away from the alarm level by the value of HY H. For example if AL H = 80 and HY H = 5, the alarm is activated when the display value is 80 and is deactivated when the display value is 75. A keyboard alarm reset can be enabled by setting the hysteresis higher than the scaled range (for example 9999). This way the alarm stays on waiting for a v key press or for the display value to decrease under the alarm level. The alarm is then switched off because both relays cannot be active simultaneously. Alarm can be disabled completely by changing this setting to a negative value. This will however not reduce voltage drop. The default is 1.0.

ALHy (Alarm Hysteresis)

Hysteresis prevents relays from changing their state needlessly when the display value fluctuates near the alarm level. The alarm is deactivated when the display value moves away from the alarm level by the value of ALHy. For example if AL H = 80 and ALHy = 5, the alarm is activated when the display value is 80 and is deactivated when the display value is 75. A keyboard alarm reset can be enabled by setting the hysteresis higher than the scaled range (for example 9999). This way the alarm stays on waiting for a v key press or for the display value to decrease under the alarm level. The alarm is then switched off because both relays cannot be active simultaneously. Alarms can be disabled completely by changing this setting to a negative value. This will however not reduce voltage drop. The default is 1.0.

Dec (Decimal)

The number of decimals displayed. Options are 0, 1, 2 or 3. Default is 1.

Lo (Low)

The display value shown with a 4mA current. Default is 0.000.

Hi (High)

The display value shown with a 20mA current. Default is 100.0.

Dead

Dead changes the lowest numbers of the display to show zero. For example if Dead=5, the display will function normally with a value higher than 5, but values lower than 5 will be forced to 0. Negative display values can be disabled by setting Dead=0. Negative values will disable this setting. Default is -1.00.

LoPass (Low-Pass)

A digital low-pass filter for damping big display values and fluctuations. The value is a time constant in seconds. Default is 0.5 seconds. The filter is disabled when the value is 0. Alarms are controlled by the filtered value, so the low-pass filter also increases alarm reaction time. Default is 0.5.

Intens (Intensity)

Display intensity. With the current below 6mA, the intensity decreases automatically so that at 4mA it is at most half of the maximum intensity. Value range is 1...15. Default is 15. 11 TrF (Transfer Function) LIN = normal display, Sqrt = square root or PoLy = polynomial function. Before square rooting negative values (<4 mA), the minus sign will be removed and afterwards returned. This enables, for example, measuring backward flow assuming the sensor works correctly.

Poly (Polynomial)

This menu will be visible if the TrF setting is changed to PoLy. Defaults are P1 = 1, P2 = 0, P3 = 0, P4 = 0. More information about this function is available at support@vpinstruments.com

ALCF (Alarm Configuration)

LoHI = low and high alarms. HIHI = two high alarms. Default is LoHI.

CFCo (Configuration security code)

CFCo is a security code needed to enter device configuration. Enable this by changing the value from OFF to Set. When Cod.0 appears to the display, press keys 1-4 to enter six digit code twice in a row. Left key corresponds digit 1, next key corresponds digit 2 etc.

Undo

Exits configuration and cancels any configuration changes.

Save

Exits configuration and saves any configuration changes.

6.3 Calibration

The display's offer the option to get calibrated. This guarantees that the current measured is correct. Attach a accurate (adjustable) current source to the 4 .. 20 mA input and follow below instructions

1. Press and hold ^, v and *
2. Press v to move to the CAL setting
3. Press > to enter the CAL setting
4. Enter calibration code by pressing ^^v v^*
5. Supply accurate 4 mA current to the device input
6. Press > and then *
7. Press v to move to the 20 mA position
8. Supply accurate 20 mA current to the device input
9. Press > and then *
10. Press *, > and * to save calibration

7 Specifications



Please always check the label of your product for the specifications.
Specifications are subject to change as we are continuously improving our products.
Please contact us to obtain the latest specification sheet.

General

Display	4 digit red LED, 14.5 mm digit height with adjustable intensity
Keyboard	Keys under the front panel surface
Input	4 .. 20 mA
Display range	-999 .. 9999, free scaling
Accuracy	0,05 % of span @ 18 .. 28 °C
Thermal drift	< 100 ppm / °C
Measurement speed	about 0,25 s (4 Hz)
Screw terminals	Removable. 2,5 mm ² conductor
Protection	Input is protected for wrong polarity and over current of 100 mA
Voltage drop in current loop	Maximum of 4.8 V with 4 .. 20 mA (comparable to 240 ohms loop resistance). With alarms on maximum of 7.3 V

Alarms

Alarm relays	2 solid state relays, maximum of 250 VDC/VAC, Cat II, 150 mA, about 12 ohms. Insulation to current loop is momentarily 4 kV
Alarm reset	Automatic or hold, reset with keyboard
Alarm mode	High and low alarm or two high alarms

Mechanical & Environmental

Dimensions	100 x 100 x 57 mm 3.94 x 3.94 x 2.24 inch excluding cable glands
Weight	210 grams 7.41 ounces
Material	ABS plastic, grey
Cable glands 301, 302	2 pcs M16x1.5, cable diameter 5 .. 10 mm
Protection grade	IP65 NEMA 4
Ambient temperature	-10 .. 60 °C 14 .. 140 °F
Ambient humidity	< 95%. Avoid condensation at all times

Certification

CE	EN 61326-1:2013, EN 61010-1:2010, EN 50581:2012
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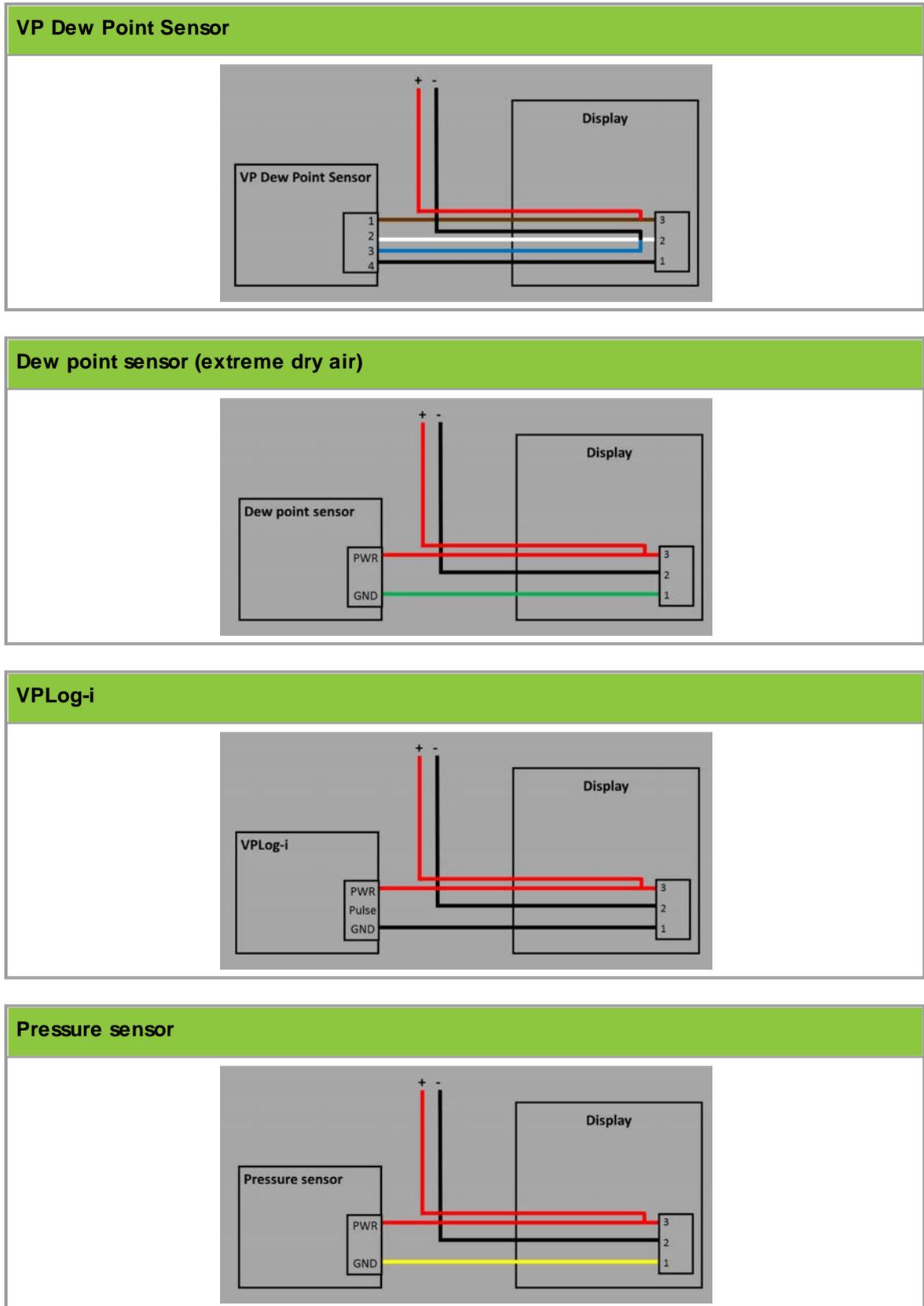
8 Order information

VPA.8000.1512 External display
 VPA.8000.1513 External display with alarm relays

4..20mA Sensors

VPA.8000.1018	VP Dew Point Sensor	-70 .. 60 °C	-94 .. 40 °F
VPA.8000.1019	VP Dew Point Sensor start kit	-70 .. 60 °C	-94 .. 40 °F
VPA.8000.1003	Dew point sensor 5/8" UNF	-100 .. 20 °C	-148 .. 68 °F
VPA.8000.2100	VPLog-i AC current sensor	100 A-rms	
VPA.8000.2200	VPLog-i AC current sensor	200 A-rms	
VPA.8000.2400	VPLog-i AC current sensor	400 A-rms	
VPA.8000.2800	VPLog-i AC current sensor	800 A-rms	
VPA.8000.21K5	VPLog-i AC current sensor	1500 A-rms	
VPA.8000.1020	Pressure sensor BSP thread	0 .. 16 bar abs	0 .. 232 bar abs
VPA.8000.1030	Pressure sensor NPT thread	0 .. 16 bar abs	0 .. 232 bar abs

9 Connection examples



10 Troubleshooting

Issue	Solution
No display	Measure the voltage between pins 1 and 2. Pin 1 should be positive. Remove the positive wire from terminal block 1. Measure between the top of pin 1 terminal block screw and removed positive wire. The current should be at least 4mA. If the device still has no display, return it for service
Keyboard not working	Make sure the "Remove for keylock" or "KEYLOCK" jumper header is not closed
A1 or A2 LED is lit but the alarm relays do not work	Make sure the "Alarms OFF" or "Remove for alarms" jumper header is not closed. Also note that the alarm relays cannot be on simultaneously with a loop current below 8mA. Models 201, 301 and 305 have no alarm relays.
A1 or A2 LED will not light up and the alarm relays do not work	Make sure ALHy, HY L or HY H value is not negative.

easy insight into energy flows

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