

VPFlowTerminal user manual

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MAN-VP-T5110-UK
Revision:2
Date:13-12-2013

www.vpinstruments.com



VPFlowTerminal user manual

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Creation date: 13-12-2013 in (Delft)

Publisher

VPInstruments
Delft, The Netherlands

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1 Warning - Read this first

	Compressed air can be dangerous! Please familiarize yourself with the forces under pressurized conditions. Respect the local guidelines and regulations for working with pressurized equipment.
	Gas flow through pipes follows certain physical laws. These physical laws have serious consequences for the installation requirements. Familiarize yourself with these laws to make sure that the product is installed correctly. Always make sure that upstream length, downstream length, flow, pressure, temperature and humidity conditions are within specifications.
	Precision instruments need maintenance. Check your flow meter regularly and make sure it remains clean. When polluted, gently clean the sensor using demineralised water or cleaning alcohol. Precision instruments need regular re-calibration. The <i>VPFlowScope</i> is guaranteed for 24 months on manufacturing defects, when used in clean, filtered, oil free and dry compressed air. However, when the air quality conditions are not met, the re-calibration interval may become shorter than 24 months. VPInstruments offers service contracts which cover a one year re-calibration, firmware upgrades and minor repairs.
	Not intended for fiscal metering or billing. Our flow meters are not certified for fiscal metering. Laws on fiscal metering and billing may vary per country or state.
	Do not overestimate the results. The practical measurement uncertainty of <i>VPFlowScope</i> is +/- 5%. Do not expect less than 5% measurement uncertainty from any measurement as this is physically impossible due to the nature of turbulent pipe flows. Our products are not intended to be used as a single means to determine compressor capacity.
	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 !

2 Introduction

Dear customer,

Thank you for purchasing the *VPFlowTerminal*. The *VPFlowTerminal* is a remote display for the *VPFlowScope* product family, has a built-in data logger and provides input for 4 analog inputs.

Great products deserve great user manuals. We have done our best to make this user manual as complete as possible. New users, please read it carefully to familiarize yourself with our products. Experienced users can check out the [Quick start chapter](#).

This manual is dedicated to:

VPT.5110.000

Do you like our products and this user manual? Tell others! Do you miss something? Let us know via sales@vpinstruments.com!

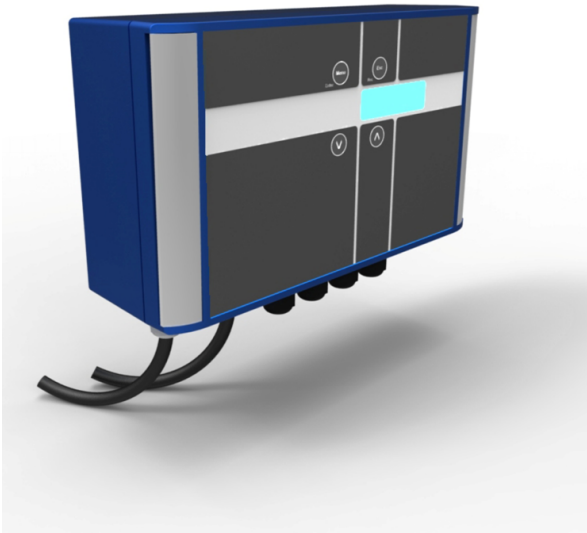
3 Product overview

The *VPFlowTerminal* is intended as remote display. It provides local read out on locations where the *VPFlowScope* is placed in high or unreachable locations. The display provides read out for flow, pressure, temperature, totalizer and up to 4 analog inputs.

To make the *VPFlowTerminal* even more complete, a 2 Million point data logger and Modbus to Ethernet converter are integrated.

The *VPFlowTerminal* can be used in combination with the:

- *VPFlowScope probe* Thermal Mass
- *VPFlowScope in-line* Thermal Mass
- *VPFlowScope probe* Differential Pressure



4 Quick start

This chapter contains the basic steps to start using your *VPFlowTerminal*. Additional information on all subjects can be found in the next chapters.

1. Unpacking

- Unpack the box and check if all items are there and in good shape. A checklist with all items is available on the box

2. Configuration

- Connect the *VPFlowScope* sensor to the connector cap of the *VPFlowTerminal*
- Power up the *VPFlowTerminal* and connect the USB cable to a computer
- Configure inner pipe diameter, log intervals, 4..20mA inputs and other required parameters with *VPStudio*

3. Mechanical installation

- See the user manual for the best point of installation for this product. Make sure that all specifications are met
- 4 holes are available to mount the *VPFlowTerminal* on the wall
- Install the *VPFlowScope*. Installation guidelines can be found in it's manual. Read this carefully

See chapter [mechanical installation](#) for more detailed information.

4. Electrical installation

- A cable for connecting the *VPFlowScope* is pre-assembled. Connect the connector cap to the *VPFlowScope*
- Apply 100-240 VAC to power up the device, the display will light up when power is applied

See chapter [electrical connections](#) for more detailed information.

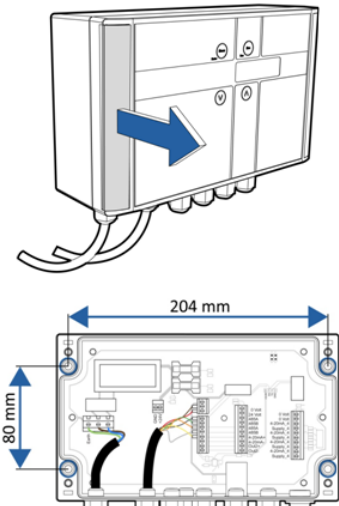
5. Data recording

A data log session can be started by pressing the esc button and then enter. All parameters will be logged with the default logging intervals. These logging intervals can be changed with the *VPStudio* software. This software tool is also used to retrieve the recorded sessions

5 Mechanical installation

First select the right installation point. Make sure that the *VPFlowScope* is within range of the cable. It is not possible to extend the cable.

Follow the next six steps for installation.

<p>1. Remove the silver strip at the left side by lifting it up with your fingernails and pull it towards you</p>	
<p>2. Remove the two screws and open the cover</p>	
<p>3. Hold the <i>VPFlowTerminal</i> at the preferred position on the wall and mark the four installation holes with a pencil</p>	
<p>4. Lay the <i>VPFlowTerminal</i> aside and drill the marked points</p>	
<p>5. Insert a jack in each hole</p>	
<p>6. Hold the <i>VPFlowTerminal</i> in front of the drilled holes and screw it through the connection holes to the wall</p>	



Do not install the *VPFlowTerminal* upside down



Do not install the *VPFlowTerminal* 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

6 Electrical connections



Turn off power when the *VPFlowTerminal* is opened

The *VPFlowTerminal* has a pre-assembled cable for the *VPFlowScope*. The *VPFlowScope* in-line with M12 8-pin connector can be connected to this cable directly. A connector cap with M12 8-pin connector is used to connect the *VPFlowScope probe* models. A *VPFlowScope* with 5-pin connector can not be connected.

A *VPFlowScope* needs to be connected to the *VPFlowTerminal* in order to work. It is not possible to use the *VPFlowTerminal* without the *VPFlowScope* connected.

To access the inputs and outputs of the *VPFlowTerminal*, the case needs to be opened. Make sure that it is tightened well to maintain the IP grade.

6.1 Connections

At the bottom of the *VPFlowTerminal* there are several connections as seen in the image below.

1. AC Mains inlet	
2. Cable with connector cap for <i>VPFlowScope</i> (pre-wired)	
3. Optional cable inlet/outlet for <i>VPFlowScope</i> RS485 bus.	
4. Analog input 1	
5. Analog input 2	
6. Analog input 3	
7. Analog input 4	
8. Ethernet connector for <i>VPFlowScope</i>	
9. USB connector	

6.2 Electrical overview

1. AC Mains screw terminal	
2. Power supply	
3. Secondary fuse (2x)	
4. <i>VPFlowScope</i> input screw terminal	
5. <i>VPFlowScope</i> output screw terminal	
6. RS485 Ethernet converter	
7. Analog input (4x)	

6.3 VPFlowScope connections

VPFlowScope connection

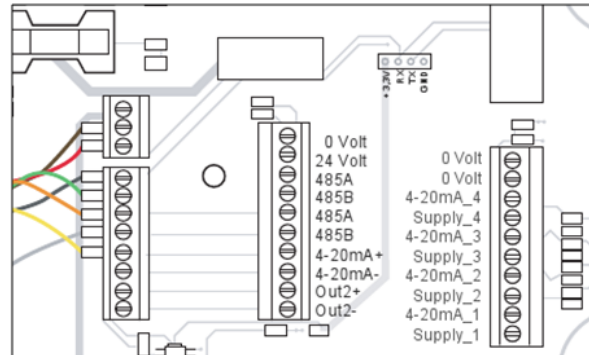
The cable to the *VPFlowScope* is pre-wired. All signals are available on the middle screw terminal block. These signals can be used for connection to a building management system or Modbus chain.

RS485:

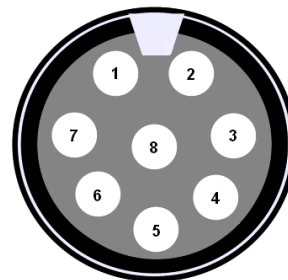
These terminals are available in pairs, and can be used for RS485 networking. Use twisted pair shielded cable, with two pairs. One pair for A and B, and one lead of the other pair to interconnect the 0 Volt wire.

4..20mA:

The 4..20 mA output of the *VPFlowScope* is Active, which means that the *VPFlowScope* powers the loop. For *VPFlowScope* only the 4..20 mA + is used. 4..20 mA - is not connected.



Pin	Signal
1	Rx
2	0 Volt
3	Tx
4	4..20 mA signal, active
5	RS485 A
6	RS485 B
7	Not connected
8	+12...24 VDC

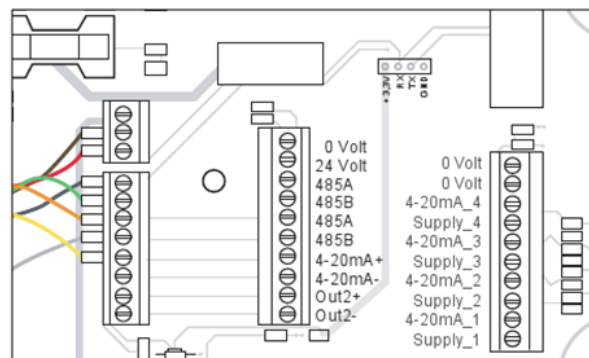


6.4 Analog inputs

Analog inputs

The *VPFlowTerminal* features 4 powered loop analog inputs. Each input has a 24V supply and a return input. The current signal is measured within this loop

If the analog sensor requires a separate power supply which means that it is not powered from the loop, the 0 and 24V outputs can be used. (150mA max)



6.5 Ethernet converter

The *VPFlowTerminal* contains a built in Ethernet port. This port is based upon a Lantronix xport module. In order to use this port, it needs to be configured and assigned with an IP address. The application to configure the port can be downloaded from www.lantronix.com. Search for deviceInstaller in the download area.

Xport configuration

- Download and install deviceInstaller from the Lantronix website
- Power up the *VPFlowTerminal* and connect an Ethernet cable to your computer.
- Start deviceInstaller and click search. The Xport should be found.
- When the port is not listed, assign a fixed IP address to your computer
- Select the xport module and go to the tab "web configuration". Then click the green button to open the configuration window. Log in with username "admin" and leave the password form empty.

Addressing an IP address

Select the option "network" in the menu. Here you can adjust the network settings of the xport.

Setting the baud rate

The xport converts the RS485 signal from the *VPFlowScope* to Ethernet. Therefore, the xport needs to know what the communication parameters are. Click serial settings in the menu to change. Make sure that the settings match the *VPFlowScope* settings.

Other options

All other options for the xport are pre-configured and may not be changed. Changing these parameters may cause the converter to stop working.

Modbus communication

Once the port is installed, the *VPFlowTerminal* is ready to be used with Modbus. All *VPFlowScope* parameters are available according the *VPFlowScope* manual. Note that the signal is Modbus RTU over TCP.

VPStudio communication

For communication with *VPStudio*, a virtual COM port needs to be created as *VPStudio* does not support IP communication.

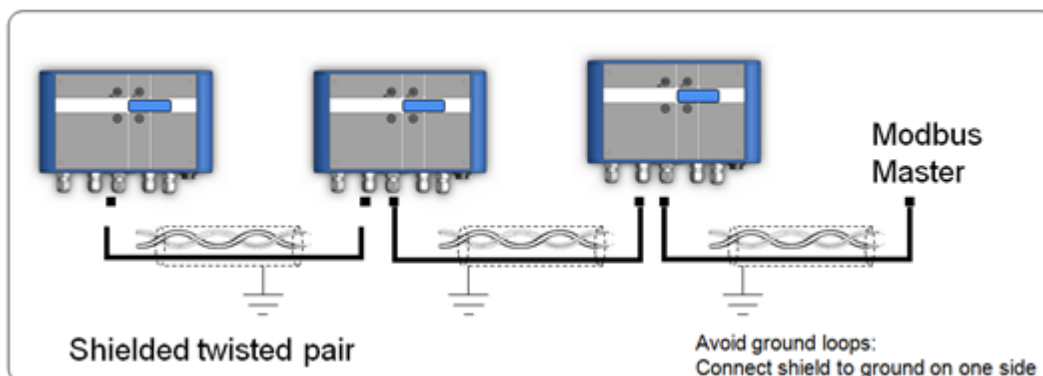
A virtual COM port can be created with the CPR (COM Port Redirector) from Lantronix. This software can be download at www.lantronix.com

Install and run the software and follow next steps:

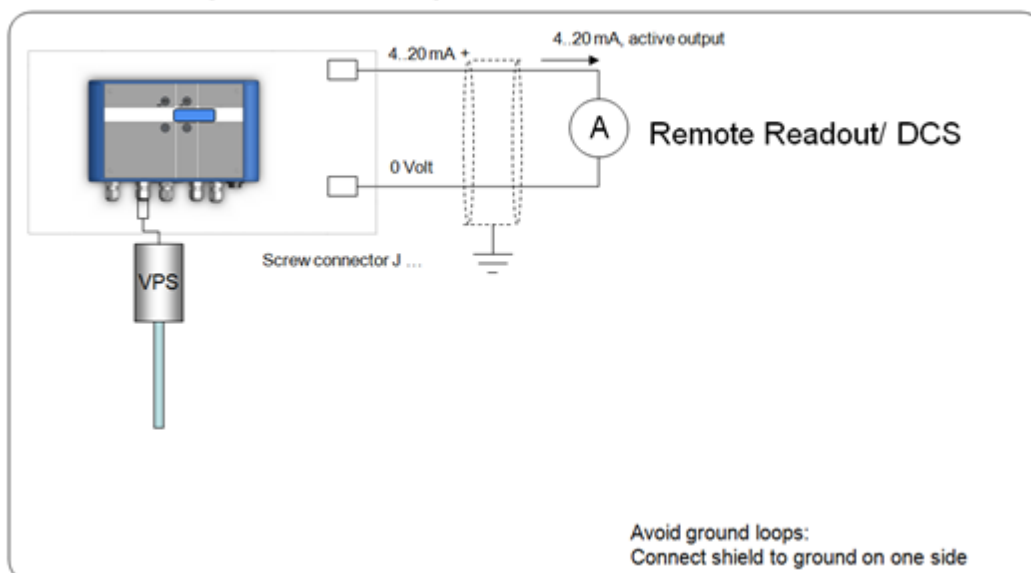
- Click the add/remove button above the list of all COM ports. Note: there may be inaccessible COM ports in the list. These are reserved by your system and should be left alone.
- Select an available COM port and click OK.
- Click the "search for device" button. The CPR software will search for Lantronix devices connected to the network. All found devices will appear in the device list below the COM ports.
- Double click on the COM port you want to assign the device to and a new window will appear. Leave these settings as is and right click on the device you want to connect to the port. Then choose the option "add to settings". The IP address will appear with it's TCP port.
- Clicking the save button will rise a new tab called [number] test. Go to this tab.
- Click on the open button and the port will be tested. When all went well, the connection is in place and can now be used.
- NOTE: When the CPR software has issues, lower your firewall settings.

6.6 Schemes

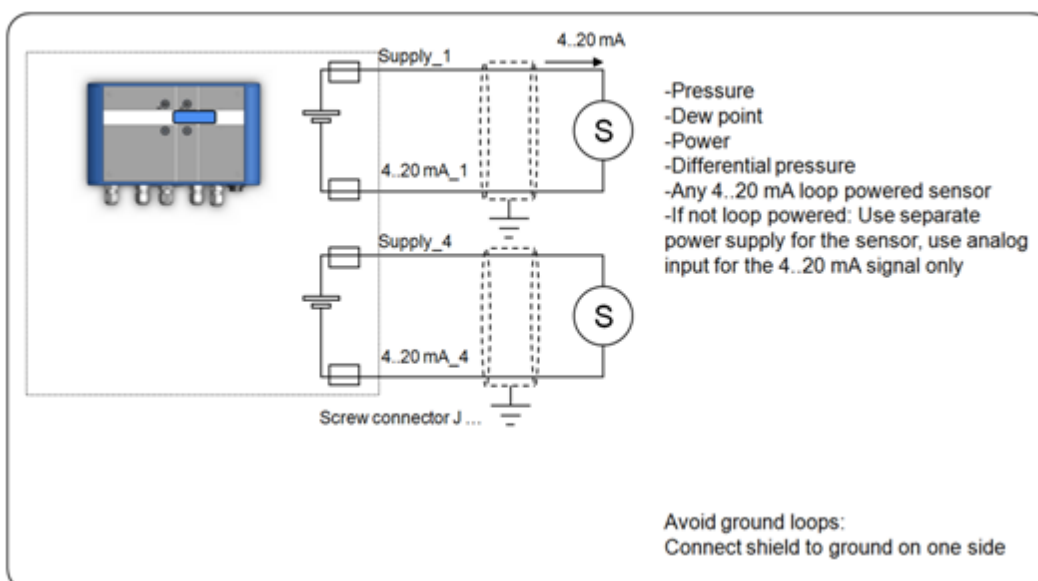
Modbus (RS485)



4..20 mA output VPFlowScope



4..20 mA sensors









7 Display

The display is used for real time read out of the *VPFlowScope* sensor inputs and the analog signals. This chapter explains all functionality.

7.1 Display status icons

Some status icons show feedback on the meters' status. Below is a list with explanation

Icons	Description
	Sensor module is properly connected and supplied with power
	No communication with the sensor [Check external power when disconnected]
	A blinking dot will indicate that a data session is active
	2 rotating arrows indicate that there is communication with the computer
	The display is locked. The menu can not be accessed
	Memory indication. Each block indicates 20% of memory usage. The blocks start to blink if the memory is more then 95% full

7.2 LCD display

The LCD display provides 3 rows for real time data. Each row can be configured in the menu by selecting the desired parameter for this row.

Available options are listed in [menu -> display](#).

7.3 Data Logger

The built-in data logger offers you 2 Million data points. Enough to measure all three channels 1 x per second for more than a week. A little warning though: more data does not always lead to better insight in savings! The analog inputs can also be stored in the data logger. The log interval for each input can be set with the *VPStudio* software.

Use the following guidelines for the intervals

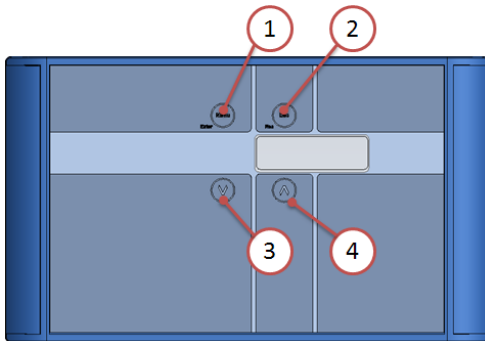
Application	Flow	Pressure	Temperature
Standard energy management application	5 min	5 min	5 min
Machine testing - quick fluctuations	1 sec	1 sec	1 sec
Audit - one week	10 sec	10 sec	5 min
Audit - one month	30 sec	30 sec	5 min

Multiple sessions can be recorded. When a session is started, a separate session will be recorded. It's not possible to append to an existing session.

When a power failure occurs during recording, the session will be stopped. When power is restored, a new session will start automatically.

7.4 Keypad

The key pad contains 4 buttons to control the *VPFlowTerminal*



- | | | |
|---|-----------------|--|
| 1 | Menu / Enter | Used to enter the (sub)menu or to confirm a setting |
| 2 | Escape / Record | Will start a data logging session when in the data acquisition screen.
Will return from a (sub)menu when not in the data acquisition screen |
| 3 | Button down | Navigate down in the menu |
| 4 | Button up | Navigate up in the menu |

Special key functions

- Lock display
In the main screen, press up and down simultaneously to lock or unlock the display. A lock icon will appear in the right lower corner of the screen. The lock function will block keypad functionality.
- Clean re-boot.
Hold esc pressed when turning the power on. Use this option when a display will not start up or if a session won't stop. This can happen due to subsequent power failures at the moment that the memory is almost full.

7.5 Menu

The menu is categorized into 3 main items which contain their own sub menu items. The complete menu structure is shown below:

1. Settings
 1. Display
 2. Date and Time
 3. Modbus address
 4. Display dimtime
2. DAQ Sessions
 1. New Session
 2. Delete all
3. Advanced
 1. Reset

1 Settings

The settings menu can be used to change both functional parameters as display settings.

1.1 Display

The main screen of the display contains 3 rows to display measurement values. Via this menu measurement values can be assigned to these rows. Available options in the menu are:

Measurand	Available units	Description
Empty	-	Leave this display row empty
Flow	m _n /sec m ³ _n /h l _n /min CFM m ³ /min sfps	Flow values are normalized: 0 degrees C and 1013.25 mbar
Pressure	Bar Psi	Gauge
Temperature	Deg C Deg F	
Totalizer	m ³ _n	Flow values are normalized: 0 degrees C and 1013.25 mbar
Analog inputs [1..4]		Analog inputs can be enabled and configured with <i>VPStudio</i>
Custom		5 available units to be configured with <i>VPStudio</i> . Multiply an existing unit with a user defined factor.

1.2 Date and Time

Adjust date and time settings. First enter the menu option and set the date with the key pad. The date is formatted as: DD-MM-YYYY. After setting the date, confirm with enter and then enter the time settings in format: HH:MM:SS, again confirm with enter. The new date will become active immediately.

Date/time settings are kept actual by the real time clock until long power down. Date and time will also be synchronized with the computer when used with *VPStudio*.

1.3 Modbus address

The Modbus address can be changed with this menu option. Use the up and down buttons to change the number. Available numbers 1 – 247.

After setting the number press enter to save the address. The power of the attached *VPFlowScope* needs to be cycled to activate the new address.

1.4 Display dimtime

The display backlight dimtime can be adjusted here. The default dimtime is set to 10 seconds. Other Available options are:

- Fading off. The backlight will remain on
- 5 till 30 seconds with steps of 5 seconds

Confirming with menu will make this setting immediately active.

2 DAQ Sessions

The *VPFlowTerminal* contains a 2 Million point datalogger. Via this menu you can start and stop the sessions or delete all present data.

2.1 Start session

The session will be started when you push the enter button after selecting this option. When the session is started, the menu will close and the main screen will be shown. A blinking dot in the right upper corner will indicate the running session. The menu will be blocked when a session is active. The session can be stopped by pressing the esc button.

2.2 Delete all

All sessions will be deleted. It is not possible to delete just a single session.

3 Advanced

3.1 Reset

Reset the device. All peripherals will be reinitialized. This option is also needed when updating the display firmware. Note: The Ethernet port and VPFlowScope sensor are not reset during this sequence.

8 VPStudio software

The *VPFlowTerminal* and its attached sensor can be read out and configured with the *VPStudio* software. This software can be downloaded from www.vpinstruments.com.

In case of basic configuration and read out, use the free edition. If real time logging is required, request a license code by our sales department.

A quick start is shown below, read the *VPStudio* manual for more information. This manual can be downloaded from www.vpinstruments.com/downloads

Connect the *VPFlowTerminal* to the computer

The *VPFlowTerminal* can be connected to the computer with the USB connector. You can only download data log sessions and configure the display. For configuration or read out of the sensor the mains cable needs to be connected power up the attached sensor.

Install USB drivers

A driver needs to be installed for the USB interface. The driver might be installed automatically by your windows system or need to be installed manually. All drivers are available on our website www.vpinstruments.com/downloads.

Configure the *VPFlowTerminal*

- Start the *VPStudio* software
- In the left white window, right click to open the menu. Now click add device
- Click the scan button to search for the right COM port. Select it and click add
- Enter a name for the device
- Select USB
- Click add

***VPFlowTerminal* display read out**

- Click on the terminal icon to read out the display settings
- The status tab provides general information
- The installation tab is used to configure the settings
- Click sessions below display to retrieve session data

***VPFlowScope* sensor read out**

- Click on the plus symbol to unfold the sensor option
- Click on the sensor icon to read out the sensor settings
- The status tab provides general information
- The installation tab is used to configure the settings

9 Service

The *VPFlowScope attached to your VPFlowTerminal* needs regular maintenance to ensure that the product is functioning properly. Especially when the product is used for mobile air audits, we recommend inspecting the instrument before and after every audit to ensure that the product has not been damaged. For precision measurement equipment such as the *VPFlowScope*, a proper maintenance program is key to reliable measurement results and a long product lifetime.

9.1 Software and firmware updates

News on software and firmware updates can be found on www.vpinstruments.com, or are provided by your local re-seller. The USB interface is used for updating the firmware of the *VPFlowTerminal*. Instructions on the update procedure can be found in a separate instruction leaflet, which is distributed on request. Upgrading is only possible for authorized technicians, at own risk.

9.2 Recalibration

To keep your *VPFlowScope* in best shape, it needs recalibration. The recommended recalibration date can be found in *VPStudio*, when you read out your *VPFlowScope*. Keep close eye on this date. We advice annual recalibration.

9.3 Service subscriptions

VPInstruments offers several Service Subscriptions. Enrolling in the Service Subscription Program helps you get the most out of your measurement equipment. We keep your equipment in excellent shape, as we offer an annual re-calibration on our state of the art calibration equipment. With the latest software releases and expert technical support, you will save time and money. We offer the following programs:

- Standard Service Subscription; Re-calibration, repair*, cleaning, firmware update and warranty extension when serviced within 12 months subsequent intervals.
- Full Service Subscription; Annual exchange of your flow meter. No service time! Have a fully calibrated flow meter 24/7, 365 days a week!

** Repair within terms of usage, see general terms and conditions.*

Improved software performance, innovative new product features, and technical support helps keep you focused on what matters most for your company.

Benefits

- Annual calibrated and cleaned instruments
- Warranty extension
- Software- and firmware updates
- Live support and e-mail support by our skilled technicians

Consult your distributor for information about our service program.

10 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.

Mechanical

VPT.5110.000	230mm x 130mm x 75mm 1.6 Kg	
Housing	Painted Aluminum IP65	
Ambient temperature	0..50°C	32 .. 122°F

Electrical

Power supply	100 - 240 VAC
Primary fuse	1 Ampere
Secondary fuses	250 mili Ampere

Display

Technology	Liquid crystal
Back light	Blue with auto power save
Memory	2 Million point memory

Inputs and outputs

Analog output	VPFlowScope current / pulse output
Analog inputs	4 x 4..20mA input
Serial IO	Modbus RTU
	USB for configuration
Ethernet	Lantronix Xport converter for RS485

11 Order information and accessories

VPT.5110.000
VPS.R150.P400.VPT.KIT
VPS.R150.P600.VPT.KIT
VPS.R150.P4DP.VPT.KIT

VPFlowTerminal
VPFlowterminal with VPFlowScope, probe length 400mm
VPFlowterminal with VPFlowScope, probe length 600mm
VPFlowterminal with VPFlowScope dP, probe length 400mm

Accessories

VPA.5001.901

Connector cap with M12, 8 pin socket. For VPFlowScope (dP) sensor module in combination with VPFlowTerminal

VPStudio software

SFT.5003.300
SFT.5002.400

Licensed edition VPS&VPT
Full version

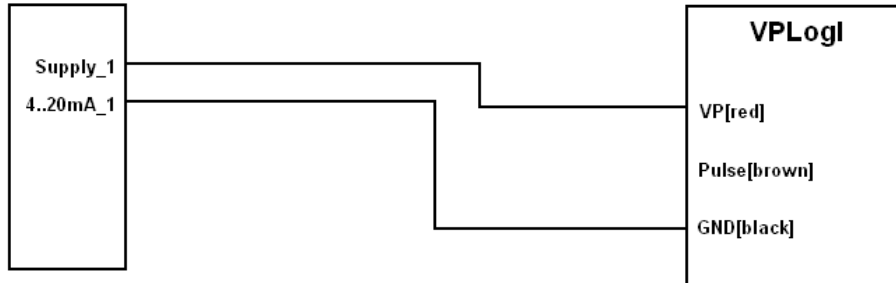
4..20mA Sensors

VPA.8000.2100
VPA.8000.2200
VPA.8000.2400
VPA.8000.2600
VPA.8000.21K5
VPA.8000.1003
VPA.8000.1006
VPA.8000.1013
VPA.8000.1016
VPA.8000.1020
VPA.8000.1030

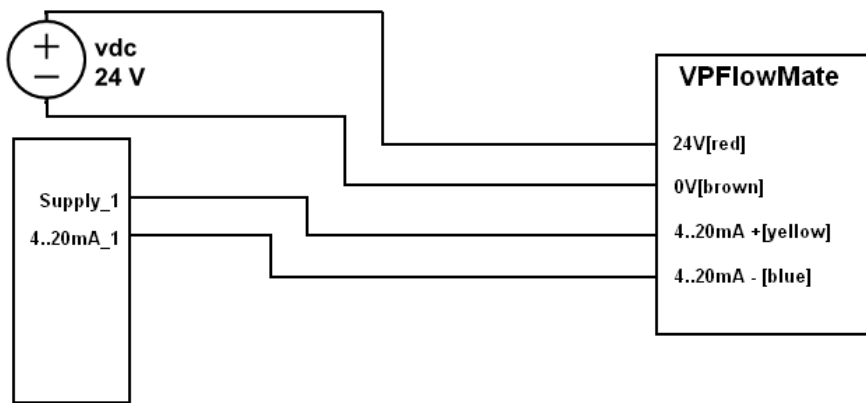
VPLog-i AC current sensor 100A-rms
VPLog-i AC current sensor 200A-rms
VPLog-i AC current sensor 400A-rms
VPLog-i AC current sensor 800A-rms
VPLog-i AC current sensor 1500A-rms
Dew point sensor -100 ... +20 (BSP)
Dew point sensor -100 ... +20 (NPT)
Dew point sensor -40 ... +60 (BSP)
Dew point sensor -40 ... +60 (NPT)
Pressure sensor 0-16 bar abs BSP thread
Pressure sensor 0-16 bar abs NPT thread

12 Appendix A - Connection examples

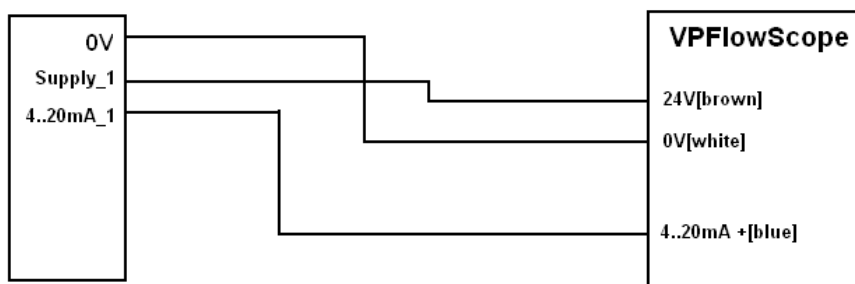
VPFlowTerminal with VPLogI



VPFlowTerminal with VPFlowMate



VPFlowTerminal with additional VPFlowScope



13 Appendix B - Zero and Span calculation

Configuration of the VPFlowTerminal for analog inputs

You need to configure the VPFlowTerminal via your personal computer, using VPStudio software.

There are three things to configure:

- The name and prefix of the sensor
- The logging interval for the sensor
- The 4..20 mA scaling for the sensor

Current to power calculation

In this example we will explain how to calculate the power corresponding to the 4..20 mA output value. Before we can do this we need some more data.

1. Measure the supply Voltage (! remember, this is a task for certified electricians)
2. Check the power factor of your motor. The power factor will be a number between 0.7 and 0.9, and is assumed to be constant.

The formula to calculate the power is as follows, for a three phase motor:

$$P(kW) = \frac{I \text{ (Ampere)} * U \text{ (Volt)} * \cosinus(\varphi)}{\sqrt{3}} * 3 * \frac{1}{1000}$$

This formula can be simplified:

$$P(kW) = I \text{ (Ampere)} * U \text{ (Volt)} * \cosinus(\varphi) * \sqrt{3} * \frac{1}{1000}$$

Lets assume a cosinus(φ) of 0.7

For a 200 Amp current clamp, the Pmax (maximum power) is:

$$P_{max} = 200 * 400 * 0.7 * \sqrt{3} * \frac{1}{1000} = 97 \text{ kW}$$

This number will correspond to 20 mA and this is the number to fill as span value.

0 kW will correspond to 4mA as this is the current level when there is no power being consumed.

This number can be filled in as zero value

So now you have configured all input you need. You can start logging now.

Setting the logging interval

The logging interval depends on what you would like to see. If you are interested in control system behavior, you can set the logging interval to 1 second, and measure for a couple of days. If you would like to see slow variations, for example the influence of daily production on the performance, you can set the interval to once per minute. For see seasonal influence, a 15 minute interval provides enough data to make the right analysis.



TIP: For flow, pressure and kW, we recommend to have identical intervals.

Notes

www.vpinstruments.com



Measure



Monitor



Manage