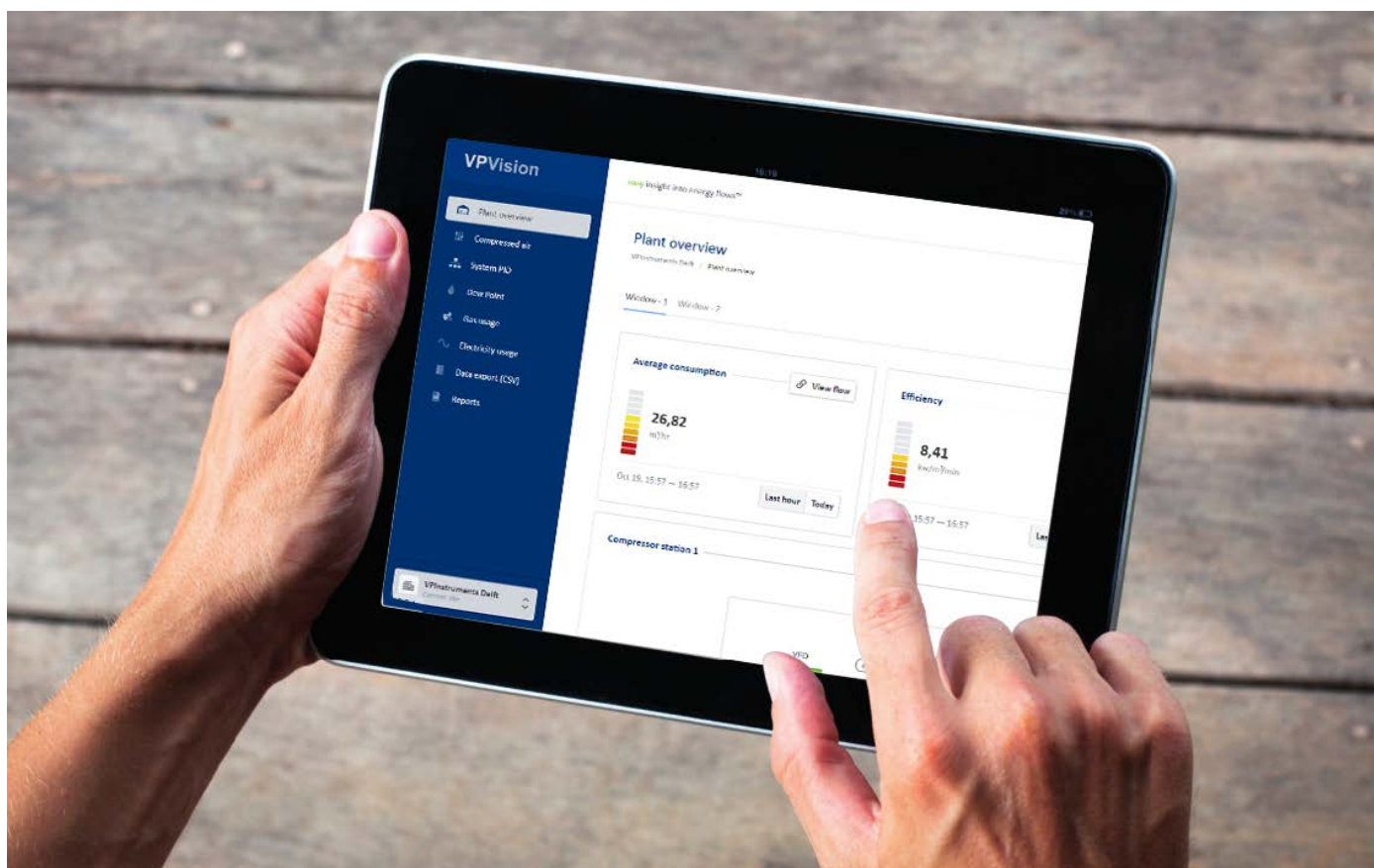

VPVision

User manual

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VPVision

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1 Warning - Read this first

	Read and understand user manuals of all equipment involved before commencing installation or use.
	All electrical installations to be carried out by authorized electrical installation engineers only.
	WARNING: 100...250 VAC mains cables are present in the housing. Do not touch the cables and the power supply when mains is applied. Keep the housing closed during normal operation. Check the cable glands on water tightness.
	Avoid heat. Make sure that the ambient temperature does not exceed the limits. Overheating might cause temporary shutdown or permanent failure of the hardware.
	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

Thank you for choosing VPVision! Let the savings begin! VPVision is a web based energy monitoring system, primarily developed to monitor all energy flows in your plant. It monitors your entire compressed air system from supply to demand side. Thanks to the standardized hardware and the modular software architecture, VPVision is scalable and adaptable.

About this manual

We have written this manual to help you to get the VPVision system up and running in no time. Basic IT and network knowledge is required. This basic knowledge should be present in your IT department. Please involve them if needed.

Sensors:

VPVision supports all VPInstruments sensors, and other Modbus RTU or 4..20 mA based sensor types. For some Modbus sensors, we offer pre installed drivers for quick and easy installation. If the pre installed Modbus sensor driver is not available, please contact VPInstruments.

Hardware extensions:

- Modbus extension module with power supply
- Modbus to Ethernet converter with power supply
- Analog to Ethernet converter with power supply
- Modbus to Ethernet and analog to Ethernet converter with power supply
- Junction boxes for the RS485 network

Software options:

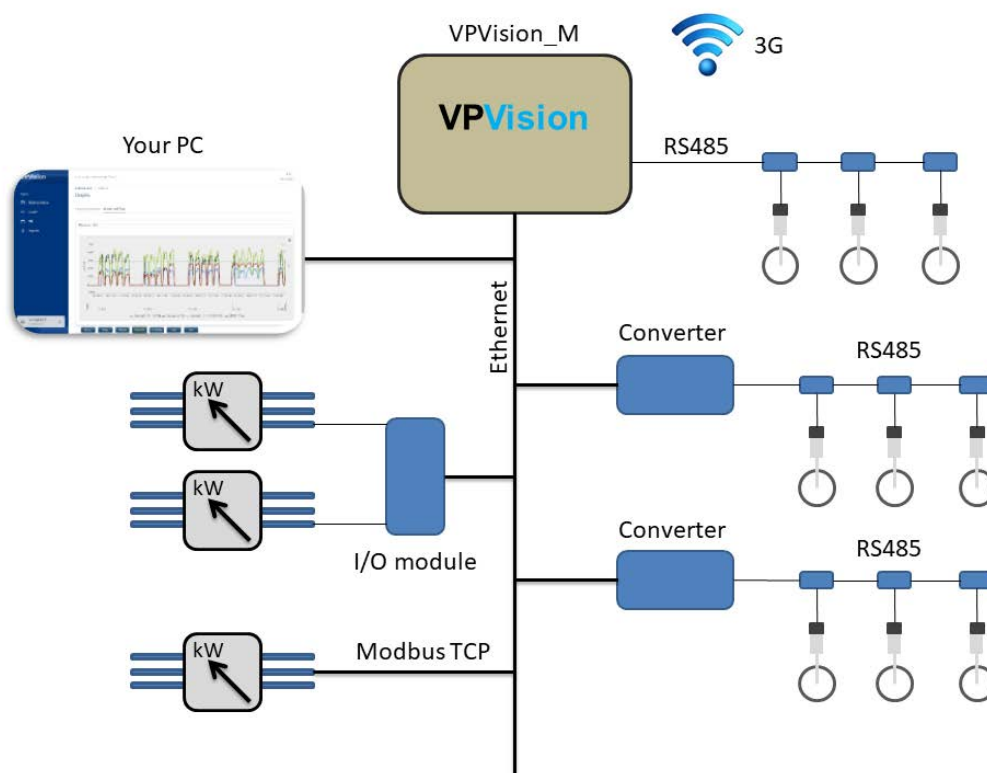
- VPVision has several software options. See our website for details, as VPVision is continuously evolving.

Language options:

VPVision is available in international English only.

2.1 System overview

VPVision is an Ethernet based monitoring system. The typical installation consists of the VPVision-M data logger with I/O converter for analog sensors and a Modbus network with one multiple sensors. The Modbus sensors can be read out via direct RS485 or an indirect Modbus/TCP converter. The I/O converters are read out via an Ethernet interface. They can gather data from 4..20 mA and Modbus based sensors. VPPVision is built around a powerful database structure with integrated web server. This makes the system flexible and scalable to meet the demands of virtually any compressed air installation.



3 Quick start in 9 steps

Step 1. Assign IP addresses and modbus addresses to all networking equipment

First, create a list of required IP addresses and modbus addresses. See also [network Preparations](#). Document this list on the configuration sheet. Get your laptop or PC, and connect it to the VPVision-M. Enter the VPVision IP address to access the system. This IP address can be found on the configuration sheet enclosed in the cabinet. Depending on your system configuration, you also have to change the IP addresses of the Modbus converters and any remote IO converters you have.

Step 2. Mount the VPVision cabinet

Unpack the box. Open the VPVision cabinet with the special key. Then remove all transport foam. Read and understand the manual and configuration sheet which are included in the cabinet. Check if all DIN Rail mounted equipment is still in place. If not, please fix the modules on the DIN Rail. Installation by certified professionals only. Find the best installation point for your VPVision based on the VPRouter and sim card reception. Mount the VPVision cabinet on a wall and establish the required Mains power connection. Read more about [hardware installation here](#).

Step 3. Configure your Modbus devices

Every Modbus device needs configuration. Depending on your type of device, different settings are required. Assign a unique Modbus address to each individual sensor, so they can be found within the Modbus network.

Third party Modbus devices can be added upon request and by consultant of VPInstruments.

Step 4. Install the sensors

Ask your certified (electrical) installation subcontractor to install the sensors, and connect it to the Modbus network. Install analog sensors and make a list of analog input channels on your configuration sheet. See also the [documentation example](#).

Step 5. Configure inputs

Configure the input channels in VPVision. You can add the sensors via [the web interface](#). Use your configuration sheet as a reference for the channel names, sensor locations, sensor ranges, diameter settings, etc.

Step 6. Configure widgets

Once the channels are in place, you can start to [configure the widgets](#). Several types are available to visualize all the data.

Widgets and sections can be named in a preferred language.

Step 7. Configure pages

Once the channels and widgets are in place, you can start to [configure the pages](#). Assign the widgets to the pages, one page can hold multiple widgets.

Step 8. Create your reports

Create your reports using the [reports module](#).

Step 9. Use VPVision and save!

Now it is time to lean back, relax and monitor your entire system. Let us know how much you did save! We will reward every white paper or savings success story with a nice gift.

4 Preparation



Preparation is the key to smooth installation. A lot of things can be prepared before the actual installation or even the purchase of the complete system.

4.1 P&ID

An overview of the installation will help you to determine where to install the sensors. Inspect all locations and make sure that all environmental specifications for the sensors are met.

4.2 Contact IT department

4.2.1 General access

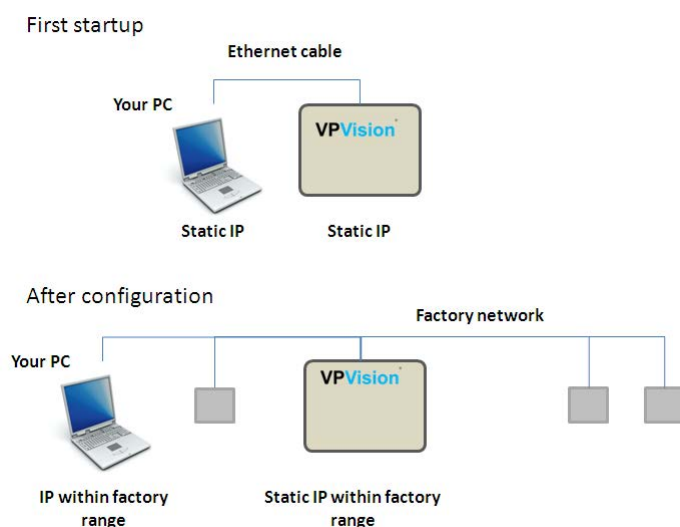
VPVision is a web based monitoring system. An Ethernet connection to the VPVision unit required to view the system from your computer. The IT department can provide you with IP address(es) and physical connection to the factory Ethernet network.

Define your network

- IP addresses must be unique
- Gateway must be defined
- Subnet mask must be defined
- DNS must be defined
- Relay host needs to be defined in order to send mail
- When using existing network structure: Get your address range: Check with client IT dept

General convention on IP numbers

To make it more easy to find a device, we will use the following guidelines to assign IP addresses to devices in the network. In existing networks, this might not be possible due to limitation.



Ethernet address example

The default address for LAN port 1: See the configuration leaflet, which comes with your VPVision system.

As an example, the configuration may look as follows:

- 192.168.1.XXX VPVision-M
- 192.168.1.XXX RS485 to Ethernet converter for remote connection to Modbus sensors

- 192.168.2.XXX Remote analog I/O converter

Example network configuration:

- 192.168.1.1 VPVision-M
- 192.168.1.2 RS485 network with Modbus sensors building 1
- 192.168.1.3 RS485 network with Modbus sensors building 2
- 192.168.1.21 Analog inputs, building 1
- 192.168.1.22 Analog inputs, building 2
- 192.168.1.41 Power meters, building 2
- 192.168.1.254 Gateway

4.2.2 Connect via Ethernet

VPVision can communicate with Modbus and analog sensors via Ethernet. In most factories, Ethernet is available throughout the complete plant. Using Ethernet converters may save you time and money. If Ethernet converters are used, make sure you request an IP address for every converter.

4.2.3 Access remotely



Make sure that your IT department provides VPN access to the network for remote support. If not possible, we strongly advise to install the 3/ 4G gateway module.

You can view the VPVision system on any computer, tablet or smartphone as long as the VPVision has access to the Internet. External access to the VPVision system is possible with the VPRouter via the VPInstruments cloud environment. Please contact you IT department in an early stage to prevent any delays. See [VPN connection](#) for more information.

4.3 Create wiring diagram

A wiring diagram will help you to determine what parts to use. Long cables can be eliminated by using I/O converters.

Inputs

Modbus devices needs to be daisy-chained with a maximum of 8 devices in one chain. See [Modbus networks](#) for more information.

Analog sensors need to be wired into an analog converter separately. Up to 8 sensors can be connected to one module.

Connection modules

Part	Description	Inputs
VPV.60XX.XXX	VPVision-M	The main module provides input for 8 Modbus devices in 1 one chain. It also provides 8 analog inputs
VPA.5030.011	Modbus extension module	This unit will provide additional power when more than 8 Modbus sensors need to be connected directly to the VPVision M. This unit needs to be installed next to the VPVision cabinet.
VPA.5030.111	Modbus to Ethernet converter	This unit provides input for 8 Modbus devices and includes power supply. All data will be transferred via Ethernet.

VPA.5030.211	Analog to Ethernet converter	This unit provides input for 8 analog sensors and includes power supply. All data will be transferred via Ethernet.
VPA.5030.311	Modbus to Ethernet + analog to Ethernet converter	This unit provides input for 8 Modbus device and 8 analog sensors and includes power supply. All data will be transferred via Ethernet.
VPA.2405.R01	VPRouter	For external access

4.4 Sensor configuration

Some sensors require configuration before they can be connected to VPVision. Read the sensor's manual for more information.

Modbus devices

A Modbus device needs to have a unique hardware address in its daisy chain. Every Modbus sensor in the same daisy chain requires this unique Modbus address. But every Modbus sensor in the same daisy chain also requires equal communication settings like baud rate, parity and stop bits for this daisy chain.

Analog devices

Analog sensor values will need to be converted in to real measurement values. This is done by zero and span where zero matches 4mA and span matches 20mA. These numbers can be calculated during the preparation and will be entered in to VPVision during configuration.

5 Hardware installation



Warning: Installation involves connection to mains. Installation of field cables requires indepth knowledge and skills. Therefore all steps that involve electrical installation should be carried out by certified installation professionals.



Make sure that the ambient temperature does not exceed the limits of the VPVision-M cabinet (max 40 deg C | 104 F). Higher ambient temperature requires cabinet cooling.



Check if the earth wire (field ground) is free of interference and potential dangerous high voltage. Make sure the circuit breaker is in off position. Then install the L, N and Earth wire. The L, N and Earth may have a different color, depending on your local legislation and directives for medium voltage systems.

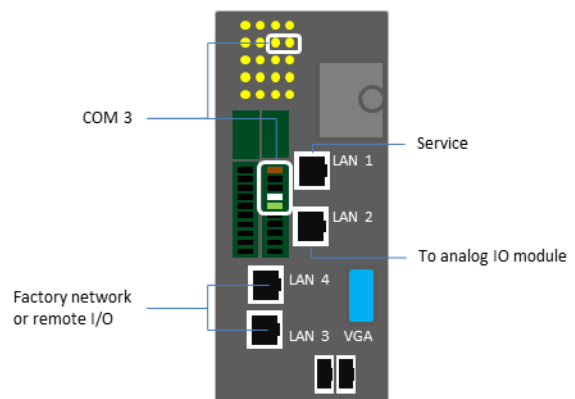
5.1 PC connection



You need to set your computer's IP address to a static ip address when connecting your computer to the VPVision-M. The address should be within the same IP range as the VPVision. See the configuration sheet which comes with your VPVision-M to find the default configuration.

To connect your PC or Laptop, open the electrical cabinet. You will see the VPVision-M unit. On the VPVision-M you will find multiple Ethernet Ports. By default, LAN 1 is used for configuration. The other ports can be used to connect to the factory network or to remote I/O modules.

Connect an Ethernet cable between laptop (PC) and the VPVision-M LAN 1. The Laptop should have a static IP address within the same range as the VPVision-M. If you don't know how to set a static IP address on your laptop, please contact your IT department. Make sure the IP address is not the same as the VPVision-M.



Open your webbrowser, type in the IP address of the VPVision-M and you should see the startup screen. Now you can configure the system ([see Configuration backend](#)).

Pinout COM port:

Brown: gnd

White: Modbus A

Green: Modbus B

5.2 RS485 connection



Installing a RS485 network require specific knowledge. Not following the specifications strictly might result in in-correct communications and equipment damage. Please leave installation up to professional contractors. Make sure that they read this chapter carefully and follow up all RS485 guidelines.

RS485 connection terminal

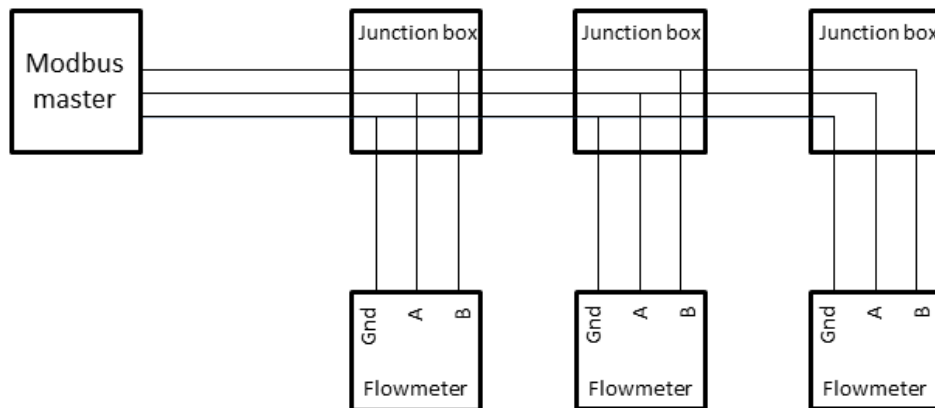
The VPVision M features 1 pre wired RS485 interface. The RS485 is connected to COM3 of the VPVision computer. It contains the following pins:

Pin	Description
1	Data B
2	Data A
3	Power -
4	Power + (24VDC)

3 more COM ports are available on the VPVision computer. A Modbus extension module can add additional RS485 screw terminals and power supply for one of these 3 COM ports. This enables you to create 3 more daisy chains.

RS485 wiring

RS485 is a differential balanced line over twisted pair. It can span relatively large distances up to 1200 meter | 4000 feet. The wires should be connected as a point-to-point configuration, or also called daisy chain. Do not install as star or ring network! The trunk line goes from the master to all devices making a drop down to each device. The cable length from the trunk line to the Modbus device needs to be as small as possible. Junction boxes are used to make the T junction.



Shielded twisted pair should be used. For Modbus field cabling only use the [recommended cables](#) sized and shielded in line with the specific situation in your plant. Connection of a third wire between the master and slave should be done to limit the common mode voltage that can be impressed on the slaves inputs. The cable shielding should only be connected at the earth rail in the VPVision cabinet. The cable shielding should not be connected to any other earth connection point.

Bus power

The VPFlowScope probe can be powered via the same trunk line. 2 separate wires are used for power + and power -. Take in account that long wires with multiple slaves will cause voltage drops. The minimum supply voltage is 12VDC measured at the last VPFlowScope probe in the daisy chain.

Termination resistor

Termination resistors reduce electrical noise sensitivity. They need to be added to the installation when cable distances become longer than 10 meter. The value of each termination resistor should be equal to the cable characteristic impedance (typically, 120 ohms for twisted pairs).

There can only be one termination resistor at the very end of the trunk line. The VPInstruments junction box features a jumper that can be used to enable a 120 Ohm resistor. When using the

VPInstruments Modbus Junction boxes make sure that the 120 Ohm resistor is only enabled in the last Modbus Junction box in the daisy chain.

Biasing

When there is no data activity on an RS485 network, the communications lines are "floating" and, thus susceptible to external noise or interference. Receivers on a RS485 network have built in hysteresis (200mV differential required to insure known state). To insure that a receiver stays in an inactive state, when no data signal is present, bias resistors are required. Bias resistors are a pull-up resistor on Modbus B and a pull-down resistor on the Modbus A line. The value of the bias resistor depends on the number of devices and the supply voltage. The table below shows which resistor values can be used for different voltage in a chain with 1 to 8 VPFlowScope probes.

Supply voltage	Bias pull up	Bias pull down
12 V	5 K	1 K
24 V	10 K	1 K

5.3 Analog input connection

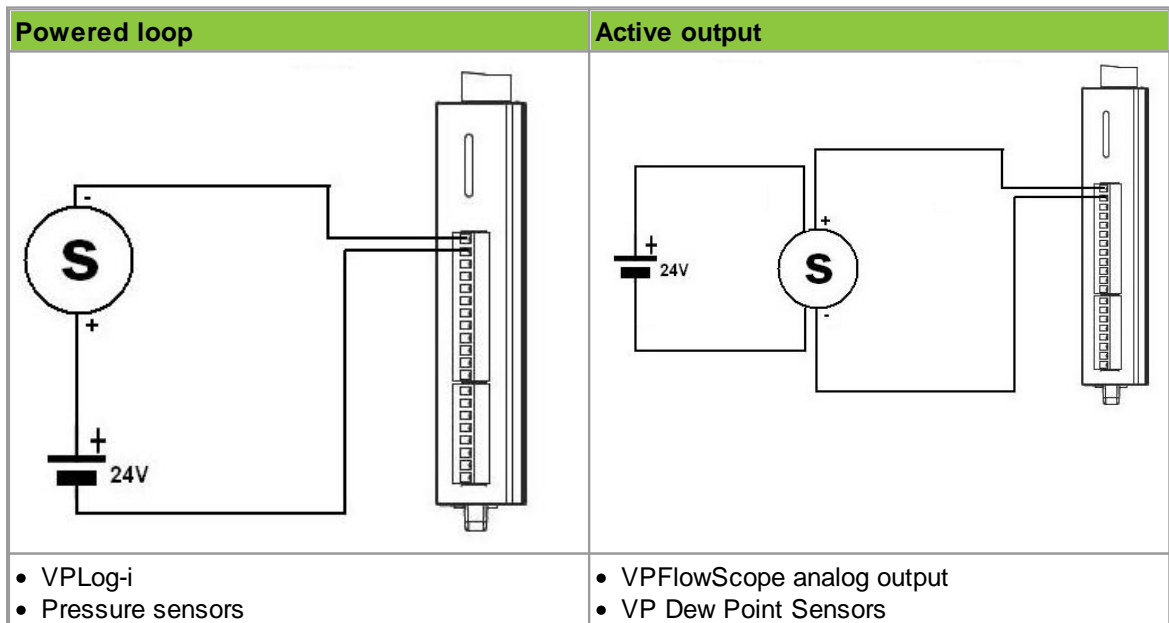
Analog sensors can be connected to the analog I/O converter. We have chosen for 4..20 mA as default interface. If needed, you can change the I/O converter to 0..10 Volt.

I/O converter description

This converter contains 8 inputs. Internally, you can find dip switches which affect the analog input configuration. It can be set to 4..20 mA (default) or 0..10 Volt.

Connecting an analog sensor

The analog input converter measures the current in the loop. This means that it needs to be in between the loop. The 24V terminal inside the VPVision-M can be used to supply power to the sensors.



5.4 VPN connection

For safe remote access to the VPVision-M without interfering with the client's network, a VPRouter is available. In this way it is always possible to access the VPVision-M from a distance and it enables remote support and updates. The VPVision does not send out or retrieve any data to the internet. As long as port 80 is blocked, the VPVision is not visible from outside the premises. For remote viewing, port 80 or another (mapped) port can be added to access the web server from remote.

A cellular internet connection via the VPRouter can be used if it is not possible to create a wired connection.

5.5 Power supplies

The base unit features a 4 Amp (100 Watt) power supply, which delivers power to the VPVision-M, up to 8 Modbus devices and 8 analog 4..20 mA loop powered sensors.

Circuit breakers

When powered from Mains, VPVision equipment is equipped with a 2-pole circuit breaker.

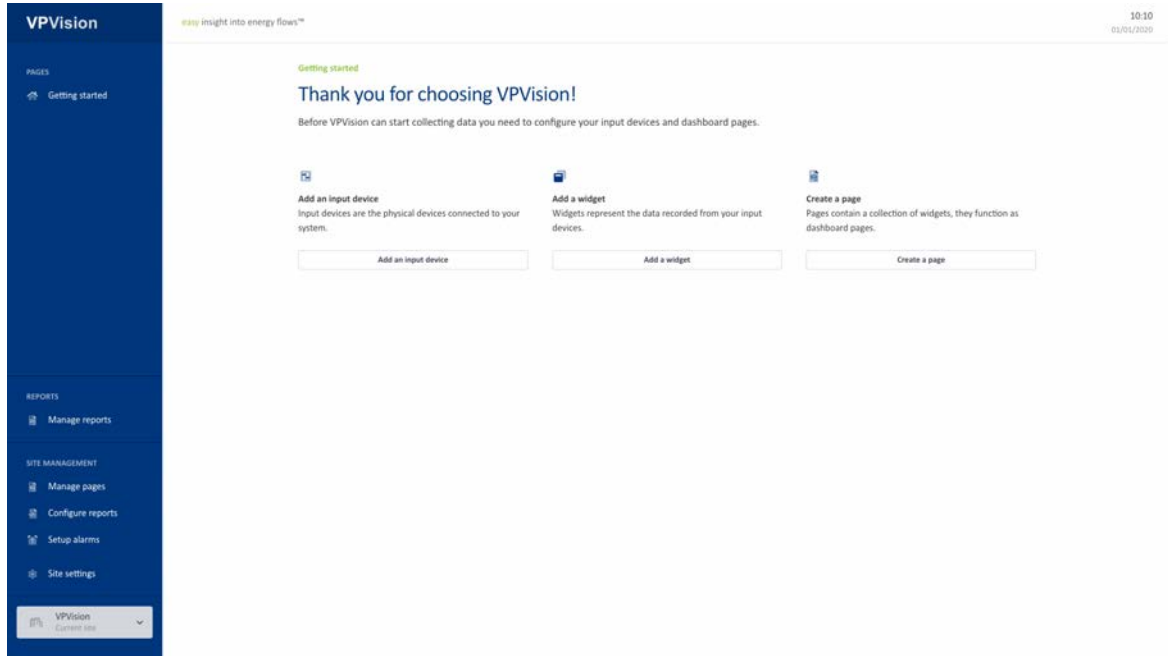
5.6 VPVision_M

The VPVision-M is mounted in a sturdy powder coated field enclosure including:

- AC IN: Two Phase Mains input 100..240 VAC. Mains is connected to a circuit breaker.
- LAN: Ethernet ports for connection to your network. Address can be pre-configured.
- The VPVision-M computer.
- Terminal Blocks: These are the RS485 and power supply terminals for connecting a Modbus daisy chain.
- 8 Ch analog input converter connected to the VPVision-M Lan 2.
- 8x 24V power supply terminal blocks, for analog sensor connection.
- VPRouter

6 Getting started with VPVision

Before VPVision can start collecting data you need to configure your input devices and dashboard pages.



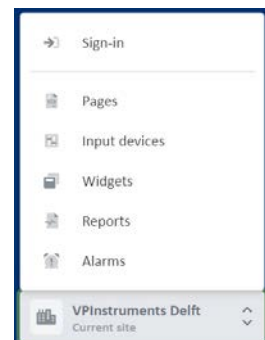
6.1 Terminology

<i>Pages</i>	Pages contain a collection of <i>widgets</i> , they function as dashboard pages.
<i>Widgets</i>	Widgets represent the data recorded from your <i>input devices</i> .
<i>Input devices</i>	Input devices are the physical devices connected to your system.
<i>Reports</i>	Reports, similar to <i>pages</i> , contain a collection of <i>report modules</i> representing the recorded data. Reports are generated as a PDF file and can be configured to be periodically generated and sent through mail.
<i>Report modules</i>	Report modules, similar to <i>widgets</i> , represent the recorded data. They are a slightly simplified static variant of the <i>widgets</i> .
<i>Alarms</i>	Alarms are configured to monitor the state of an input device. Alarms can be configured to trigger a notification when a certain threshold has been reached.

6.2 Accessing the site settings

Via the 'Current site' button, on the left side of the application, you have access to your configured pages and to commonly used site settings like, Pages, Input devices, Widgets, Reports and Alarms.

By clicking the 'General settings' (after sign-in) button you'll be directed to the backend where you can configure all available site and system settings.



6.3 Authentication

The site and system settings are protected with user authentication. By default the system is provisioned with an administrator user. You can use this user to start configuring your system.

The credentials for the administrator user are:

Username: *admin*

Password: *visionair*

It is STRONGLY recommended to change the default password for the administrator user after first authentication.

After visiting the 'General settings' and authenticating you will be presented with an additional menu containing all the available site and system settings.

6.4 User management

VPVision supports multiple users accounts. There are 2 user roles available, the default 'user' and 'admin' role.

Users with the 'user' role have limited access to the application and can only manage input devices, pages and other related resources.

Administrators have additional access to the system settings, network and user management.

You can access the user management by authenticating with an administrator user, visiting the 'General settings' followed by navigating to the 'Users' page.

6.5 Managing input devices

Input devices are critical for recording data and completely configuring your system. They represent the physical devices attached to your system.

You can add a new input by clicking the 'General settings' button in the sidebar and navigating to 'Input devices'.

Input devices need to be enabled from the 'Input devices' page before they start recording data.

Virtual Inputs

In addition to various physical device types, VPVision also includes a virtual input. The virtual input can be used to combine multiple devices into one output or completely transform the incoming data by applying a formula.

Once a virtual input has been created you will be tasked to configure a formula before activating the device.

This can be done by clicking the 'Update formula' button on the device details screen.

For more information about composing formulas please refer to The Formula Editor in the appendix.

6.6 Defining widgets

Widgets represent the data recorded from one or multiple input devices. Additionally VPVision ships with various widgets visualizing your environment and can help you in navigating between pages within VPVision.

You can add a new widget by clicking the 'General settings' button in the sidebar and navigating to 'Widgets'.

Custom formulas for KPI widgets

Out of the box the KPI widget comes with various predefined calculations. These calculations represent a formula. VPVision enables you to use your own custom formula within the KPI widget. Whilst adding a KPI widget simply select the 'Custom formula' calculation. It is possible this calculation is not yet enabled on your system.

To enable the custom formula and other calculation types simply navigate to "KPI types" after clicking the 'General settings' button in the sidebar.

On this page you can enable or disable all the KPI types you would like to use on your system. Once a KPI has been created with the 'Custom formula' calculation you will be tasked to configure a formula. This can be done by clicking the 'Update formula' button on the widget details screen. This button is only shown for widgets with a custom formula. For more information about composing formulas please refer to The Formula Editor in the appendix.

6.7 Composing pages

Pages are your primary source of data visualization. Pages contain one or multiple widgets, of any kind, and can be subdivided into multiple windows. Windows are essentially a category of your page.

You can add a new page by clicking the 'General settings' button in the sidebar and navigating to 'Pages'.

After adding a page and enabling it, either from the 'Pages' page or directly while adding a new page, the page will be shown in the sidebar.

6.8 Reports and Alarms

Reports and alarms can be configured independently from the rest of the system and aren't necessarily required to start recording data.

Both require active input devices to function correctly.

For scheduled reporting and automated alarm notifications you need to configure an 'SMTP outgoing email server'.

Without an SMTP server reports can be manually generated and downloaded from the 'Reports' page found in the sidebar. Active alarms will be shown in the alarm type widget, this widget needs to be added to your site before you can add it to a page.

Adding reports and alarms can be achieved by clicking on the 'Reports' or 'Alarms' buttons in the sidebar, or by going to the 'General settings' and navigating to 'Reports' and 'Alarms' respectively.

7 Advanced configurations

As an administrator you can configure various global settings. By clicking the 'Site settings' button in the sidebar and navigating to 'System settings' you will find various regional and reporting settings.

7.1 System status

The 'System status' page, available in the sidebar, contains an overview of your systems health.

This page is primarily used to diagnose problems with your system and contains a few actions to restart critical application and system services. These services SHOULD only be restarted when you experience problems.

7.2 License management

Your system comes pre-installed with your VPVision license, if you receive a new license you upload the new license through the 'License' page.

The 'License' page, found by clicking the 'General settings' button in the sidebar and navigating to 'License'.

Additionally this page contains all license details of your currently active license including your device's serial number.

7.3 Network settings

The 'Network interfaces' page, found by clicking the 'General settings' button in the sidebar and navigating to 'Network interfaces', contains an overview of all active network interfaces.

You may alter the network settings of these interfaces when your site requires it.

7.4 Mail server settings

The 'Mail server' page, found by clicking the 'General settings' button in the sidebar and navigating to 'Mail server', contains the configuration options for an outgoing SMTP email server.

The SMTP server is disabled by default, if you want to receive scheduled reports or automated alarm notifications this needs to be enabled. Enabling the SMTP server requires an active SMTP capable email server or service.

8 Specification



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

Cabinet	Powder coated grey steel
Size	38 x 21 x 30 cm 15 x 8.3 x 11.8 inch
Weight	10.6 kg 23.4 pounds
Ambient temperature max	40 deg C 104 F
Ambient temperature min	-10 deg C 32 F

Electrical

Power input	110-250 VAC
Component power	24 VDC
Fuses	3.15 A for analog inputs, 3.15 A for Modbus sensors

Electronics

Computer	Industrial fanless mini PC
Storage	60 GB Solid State Drive
COM ports	6x RS485
Ethernet ports	4x RJ45

Inputs and outputs

Modbus terminal	1x (<i>upto 8 Modbus sensors</i>)
Analog inputs	8x
Analog inputs modes	0..10V 4..20mA

Data storage

Database	SQL
Data retrieval frequency	1 second
Data storage interval	1 minute

9 Appendix

9.1 Modbus networks

Introduction to Modbus

Modbus is a messaging structure developed by Modicon in 1979. Its purpose is master-slave/clientserver communication between intelligent devices. It is a de facto standard, truly open and the most widely used network protocol in the industrial manufacturing environment. The Modbus protocol provides an industry standard method that Modbus devices use for parsing messages. For more information see modbus.org.

How does it work?

Modbus communication is called "Master-slave" communication: The master can initiate transactions (called queries). The slaves respond to the master, take the action requested in the query. A slave is any peripheral device (I/O transducer, valve, network drive, or other measuring device) which processes information and sends its output to the master. Masters can address individual slaves, or can initiate a broadcast message to all slaves. Slaves return a response to all queries addressed to them individually, but do not respond to broadcast queries.

Register map

Modbus devices usually include a Register Map (Point Map). You should refer to the register map for your device to gain a better understanding of its operation. The available options and registers of the point map are device-dependent. A simple sensor might have only one register, while a multi parameter sensor might have ten or more registers.

Communication modes

Standard Modbus networks employ one of two types of transmission modes: ASCII Mode and RTU Mode. The mode of transmission is usually selected along with other serial port communication parameters (baud rate, parity, etc.) as part of the device configuration. VPVision supports Modbus RTU only.

Pin layout:

A aka '-' aka TxD-/RxD- aka inverting pin
B aka '+' aka TxD+/RxD+ aka non-inverting pin
SC aka G aka reference pin

ALWAYS use the SC/ Ground reference! Without reference, Modbus networks might work for a while but eventually, you could run into communication issues due to capacitive effects or electromagnetic interference.

9.2 Cables for VPVision



All electrical installations to be carried out by authorized electrical installation engineers only.

Ethernet

For Ethernet, Cat5e cable with 4 twisted pairs must be used. For some applications, a higher quality cable might be needed. In case of any doubt, it is best to consult the site on their existing cables to make sure that the VPVision cables match the prescribed standards. The cable should match the power budget of all connected sensors. Long cables will result in increased cable resistance, which might cause issues when not properly addressed.

RS485 Modbus

For RS485 networks, cable with 2 shielded twisted pairs must be used. One pair will be used to power the connected sensors. The other pair will be used for Modbus data transfer. The quality of this cable depends on the length of the total Modbus chain and the number of sensor attached. Your local contractor can help you calculate the copper wire thickness. Make sure the shield is connected to the power supply side only.

Analog sensors

For 4..20 mA based sensors, a single or double twisted pair cable can be used. The same cable as for Modbus can be used to connect these sensors.

9.3 The Formula Editor

The formula editor enables you to compose custom formulas for virtual input devices and KPI widgets based on the custom formula calculation.

Please refer to 6.5 and 6.6 respectively on how to create these instances.

Formula Elements

Formulas are composed using formula elements. These are grouped into 3 categories: Inputs, Operators and Endpoints.

- Inputs refer to sensors or a group of sensors, also referred to as input devices.
- Operators are actions that should be performed on input elements.
- Endpoints indicate the end result of the formula.

Connecting elements

Once a formula element has been added to the editor a dot will be shown next to it. For operators this will be one or two dots to the left and one to the right of the element, endpoints will have a single dot to the left and inputs will have a single dot to the right.

These dots represent the input, to the left, and output to the right. To connect an element's output to the input of the next element simply click and drag the output dot and drag the resulting arrow to the input dot of the next element. Once an element has successfully been connected the arrow will remain between these elements. Click the arrow to remove this connection.

Grouped Sensors

Grouped sensors are only available to custom formula KPI widgets and consist of all input devices added to the KPI widget during creation. Input devices for custom formula KPI widgets are optional, once they're added the 'Summarized' and 'Averaged' input formula elements will be available in the formula editor.

- Summarized grouped inputs consist of all input devices from the same measurand type and 'sum' the data of all applicable devices.
- Averaged grouped inputs consist of all input devices from the same measurand type and average the summed data of all applicable devices. I.e. when 3 devices of the same measurand type are added the sum will be divided by 3.

Sensors, Variables and Cost Input elements

Comparable to grouped sensors the sensor input element represents a single input and allows you to select the desired channel and desired starting unit.

Variable input elements are a fixed variable, for example a multiplier or divider. The cost input element is only available to KPI widgets using the custom formula calculation from the cost KPI type.

The cost element represents the electricity cost configured whilst creating a KPI widget. This element is comparable to the variable element.

Operators

Operators apply a certain action to the input data. Most operators allow up to 2 input streams and result in one output. Operator inputs are not limited to input elements and can be combined with the output of a previous operator.

VPVision ships with 5 operator types:

	Σ	addition operator without the 2 inputs max input limit. You can link as many inputs as you like resulting in a single output.
+	Addition	limited to 2 inputs resulting in a single output.
-	Subtraction	limited to 2 inputs resulting in a single output.
x	Multiplication	limited to 2 inputs resulting in a single output.
÷	Division	limited to 2 inputs resulting in a single output.

It's important to note that the order of operations is determined by the order of connected inputs.

Endpoints

The endpoint element represents the resulting output of the formula. For virtual inputs this can result in a data conversion when the input data is not using the same unit as the endpoint dictates. This isn't applicable to KPI widgets where the endpoint simply represents a description of your resulting output.

The endpoint, the unit description for virtual inputs or the description you've entered for KPI widgets will be shown in widgets where these instances are used. This is most notable for the KPI widget as the description will be directly displayed within the widget.

9.4 Troubleshooting

9.4.1 Problems and solutions

This section will address common problems and their resolution.

Issue	Symptom	Cause	Resolution
Cannot find VPVision in my network		IP conflict, IP address out of range	Re-connect to LAN 1 with a direct Ethernet connection.
VPVision page is not updating	All widgets are static	Connection problems with remote IO, network off line, switch off line	Restart DAQ process via the configuration backend.
Communication problem	No data on screen	Modbus address not properly assigned, Modbus conflict	
	No LED blinking	Wrong Com port assignment	Check Com port in Device Configuration
	TX LED blinking, but no RX LED.	Wrong wiring	Swap RX and TX (A and B) wire and see if this resolves. Disconnect all but one Modbus device to isolate the problem.
		Wrong wiring	Check device settings like baud rate, parity, stop bits
	TCP/IP converter TX and RX not blinking	IP conflict, or not properly configured converter	Refer to converter user manual. Configure IP address. Use Modpoll to debug the connection.
Wrong kW measurement	Wrong kW in display	The VLog is just an Ampere meter... make sure that the voltage and power factor is as correct as possible	If not good enough--> invest in a real kW meter with Modbus (Shark, Wattnode).
Analog input configuration	VPVision shows 0 as measurement value	The Moxa module has been reset or the configuration is lost	Log in to the Moxa internal web server, enable user defined Modbus addresses and set all read out parameters to be located in the holding registers

9.4.2 Communication issues

RS485 Modbus related issues

- Check LED indicators on the RS485 converter. Both TX (Transmit) and RX (Receive) should blink intermittent. Blinking led, once per second: VPVision Data Acquisition is active.
- Check termination and biasing resistors. They should be enabled in the last Modbus Junction Box only.

Ethernet issues

Ethernet issues can be localized by pinging the individual components of the system. Each Ethernet device has a unique IP address. The addresses can be pinged and when they respond, you know that the device is reachable. An unreachable device will result in a request time out.

9.5 Documentation example

Proper documentation is key to long term success. Therefore we added an example (empty) documentation sheet here. You can use it as a guideline for documentation of your VPVision configuration.

IP address list

No	Name	IP address
1	VPVision-M	192.168.1.253
2	Analog converter	10.0.0.2
3		
4		
5		

Device list

Use the list below to write down your configuration. Store this list for future reference

No	Name	Modbus address	Com port	Comment
1	Packaging dept.	9	3	Pipe diameter = 80.2 mm
2				
3				
4				
5				
6				
7				
8				

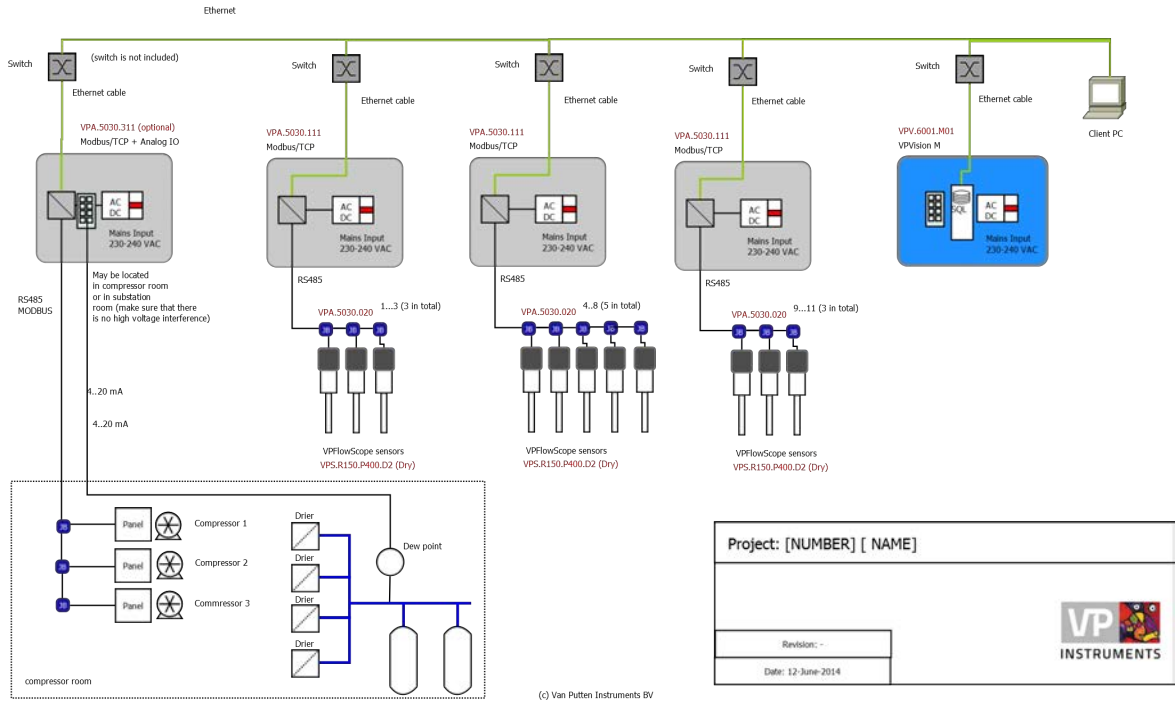
Analog Channel configuration - Remote analog IO module

Use the list below to write down your configuration. Store this list for future reference

No	Name	Min (4mA)	Max (20mA)	input number	Converter IP address
1	Dewpoint	-40	+10	1	192.168.1.250
2					
3					
4					
5					
6					
7					
8					

Schematic example

The entire network configuration should be documented. Below you find a sample sketch drawing of the network architecture.



Notes

Notes

easy insight into energy flows

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