

Data Sheet

V6000 Machinery Protection System

OVERVIEW

V6000 machinery protection system is a modular rack-based system developed for continuous machinery protection & condition monitoring platform designed to fully comply with American Petroleum Institute Standard 670 for machinery protection systems. Up to 30 vibration/position/speed inputs and 8 temperature/process variable inputs can be monitored and displayed in a single 19" rack.

The system measures and alarms on a wide variety of vibration, position, speed, temperature, and process variable inputs. All necessary monitoring functionality is provided using only four basic module types, simplifying spare parts requirements and making it customizable for every application.

A V6000 consists of the following components:

- **Rack Chassis**

V6000 system is housed in a standard 19" inch width 6U height aluminum rack. Cards are easy inserted and removed in slots which are secured to a main board fixed inside the housing. The rack has front panel and back panel which are used for signal connections. Chassis has available capacity to contain up to 12-slot size different number and type of slots used on each rack creates different appearance.

Slot 1 is always reserved for the gateway card (V6000/G). Slots 2-7 are available for Vibration/Position monitoring cards (V6000/V) only. Slot 8 is available for multifunction card (V6000/M) only. Slot 9 is available for KeyPhasor® card (V6000/K) only.



Easily adaptable mounting

V6000 system chassis design allows the rack to be used in various configurations in accordance to Electronic Industries Alliance EIA-310-D by simply employing different rack brackets. This also means that you will not need too much space for bulkhead mounting unlike systems that require twice as much space needed for mounting.

Back panel connections

Transducer outputs and relay outputs are all connected via back panel terminals to V6000 system. Alarm reset, trip multiply and system fault outputs are also placed on the back panel. Moreover, main power card (V6000/P) and if applicable redundant power supply (V6000/RP) connections with three Modbus RTU (RS-485) ports are all located on the back panel.

- **Power supply card V6000/P/RP**

V6000P power supply card is to provide power to the system and at least one of them is mandatory. One or two power supply cards may be installed in one rack. If two are installed, one of them is considered to be redundant.

V6000/P cards accept both AC & DC power based on the ordering information filled.

Front panel LEDs show the operating status of the power supply for the rack.

• **Gateway card (V6000/G)**

Gateway card four separate communications ports each of them intended for an application.

DCS1	This serial port located on the back plane uses MODBUS® RTU protocol for connecting V6000 system to a distributed control system (DCS) or other type of plant/machinery control or automation platform. This port communicates by RS-485 standard and it transmits overall values for all installed channels to a central control systems. This port supports static data only.
DCS2	Identical to the DCS1 port located on the back plane, this additional port communication is also based on MODBUS® RTU (serial) RS-485 and sends overall values and system state to a central control system. This port supports static data only.
LDP (Local Display Port)	This serial port located on the front plane uses MODBUS® RTU protocol for connection to a local PC by RS-232/RS485. It transmits overall values and the state of input parameters.
CMS	This 10/100/1000 BASE-T Ethernet port streams all the input time signals a server computer which is used by Vibsens-Pro condition monitoring software. Data can then be shared for the network clients by the server.

Although using Gateway card is not mandatory for having a standalone vibration protection system it is highly recommended to have one V6000/G installed on every card. This card is used for connection of one or several V6000 systems into one PC to have trend monitoring, alarm history and event logging. Moreover, TCP/IP port on V6000/G card is used for recording measured signal inputs on a server PC for condition monitoring and vibration analysis by Vibsens-Pro or other 3rd party software.



Vibsens-Pro software is a standard Microsoft Windows® program which has been developed to enable maintenance engineers to easily adopt vibration predictive maintenance procedures on their critical machinery.

To this end, user just needs to connect PC to V6000/G card by a direct network cable or using network hub switch.

V6000/G card is key lockable to prevent unauthorized tampering.

• **Universal Monitoring card (V6000/V)**

This card is a 4-channel dynamic input signal card which may be used for all types of signal measurements except temperature. Eight programmable SPDT relays and four programmable 4-20 mA analog outputs are provided on each V6000/V. This card accepts a large variety of proximity, velocity, acceleration position, and discrete input signals.



In each V6000 system, up to seven V6000/V cards may be installed into a single rack (slots 2-8). So each V6000 system can accept up to 28 analog inputs.

Each input of V6000/V card has one 4-20 mA proportional outputs for measurement of RMS, True Peak & True Pk-Pk of each analog signal and log the value to recorders, process control systems or other instrumentation systems. Each card features a high visibility digital LED display. The display shows current values, set points and alarm status etc. In addition, Operator uses this monitor to configure all the settings of each input.

Buffered output for each input is located on the front panel BNC connectors. User can easily connect a portable data logger or other test instrument to the system by front BNCs. Each of the dynamic input signals connected to rack panel is available on the front panel via BNC connectors for easy connection to portable and test instrumentation.

This card includes relay bypass and trip multiply configuration. Trip multiply is set for total system while relay by pass can be activated for each channel separately.

• **Multifunction Monitoring card (V6000/M)**

Multifunction card is an input card which provides 4 configurable 4-20 mA analog process variables or RTD (Pt-100). Each card has eight programmable SPDT relays assignable to 4-20 mA measurements. On the front there is a high visible digital LED display. Current values as well as setting parameters can all be



read and modified with the front panel keypad & display.

key pad.

- **Keyphasor® Monitoring Module (V6000/K)**

Up to 4 tachometers may be connected to each V6000/K card. Signals from proximity probes / optical pickup / digital TTL / magnetic sensors are all supported. This card enables speed protection and also send the phase speed data to Vibsens-Pro software. It has dry relay outputs for machine protection. For vibration phase analysis there must be only once pre revolution pulse while for speed measurement and control there may be multi pulse per revolution and should be set by the front panel



- **I.S. Barriers**

V6000 system carries globally recognized hazardous area approvals, allowing the rack to be installed for Div.2 / Zone 2 applications without use of barriers. For transducers installed in Div. 1 / Zone 1 areas, the V6000 system must be located in a safe area or a Div.2 / Zone 2 area. Intrinsic Safety (I.S.) barriers are then used to limit the available energy on the transducer signal and power connections. V6000 system supports the use of both passive (Zener) and active (isolated) barriers.

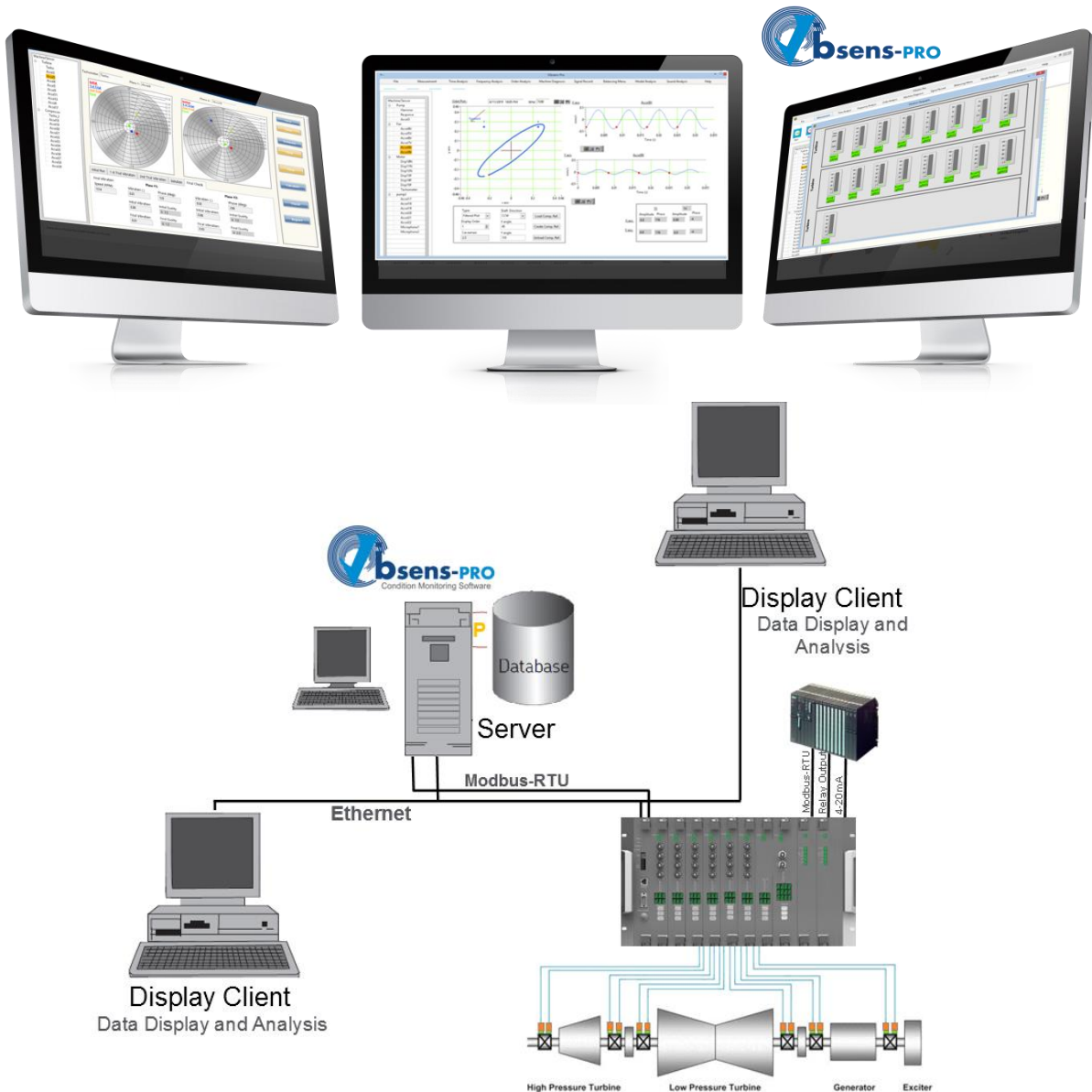


• **Vibsens-PRO CMS Condition Monitoring Software**

Vibsens-PRO is a machine condition monitoring software that collects, stores, analyzes and is capable of transmitting machine status monitoring information over local or wide area network. It provides static, dynamic and transient data collection and analysis; such as graphical indication of overall vibration values, vibration long time trend, signal waveform, frequency spectrum, orbit plot, polar plot, waterfall, bode plots, cascade plots and much more. Vibsens-PRO may be run on Microsoft Windows® platforms connecting to various Vibsens vibration protection systems.

Additionally, it collects process data via Modbus from 3rd party hardware and monitors and stores data for further data processing. With its reliability, it not only can acquire the data from third party but also share its data with third party software and hardware.

Vibsens-Pro can be used as a client running on a PC with network access to server computer and processing offline historic data. Several Vibsens-Pro samples may be ordered for multiple users either for maintenance department performing vibration analysis or a sample just used as a general trend monitoring system.



• Specifications

Specifications in this document are for rack chassis, system power, and Inputs/outputs Interface only. For detailed specifications on each module type and selected accessories, refer to the following companion datasheets:

Components	Datasheet
V6000/G	PDOI-ENG-V6000/G-Ver1.0
V6000/V	PDOI-ENG-V6000/V-Ver1.0
V6000/M	PDOI-ENG-V6000/M-Ver1.0
V6000/K	PDOI-ENG-V6000/K-Ver1.0
V6000/P/RP	PDOI-ENG-V6000/P/RP-Ver1.0
VIBSENS-PRO®	PDOI-ENG-VIBSENSPRO-Ver1.0

All specifications are at +25 °C (+77° F) unless otherwise noted.

Inputs			
Number of available Slots	<ul style="list-style-type: none"> Rack capacity: 12 		
Supported Module Types and Quantities	Module	Location	Max Qty.
	V6000/G	Slot 1	1
	V6000/V	Slots 2-8	7
	V6000/M	Slots 9	7
	V6000/K	Slots 10	1
	V6000/P/RP	Slots 11-12	2
Transducer Types	<p>V6000/V</p> <ul style="list-style-type: none"> Proximity Probes Accelerometers Piezo / Moving Coil Velocity Microphones Dynamic Pressure Sensors Dynamic Sensors (4-20mA)* Thrust Position Sensor LVDTs (DC and 4-20mA) * Process Variable Inputs (+4 to +20mA, -4 to -20 mA, 0 to +5Vdc, +1 to +5Vdc, 0 to -10Vdc) * <p>V6000/M</p> <ul style="list-style-type: none"> Process Variable Inputs – Externally Powered Only(+4 to +20 mA and ±10 V) 		

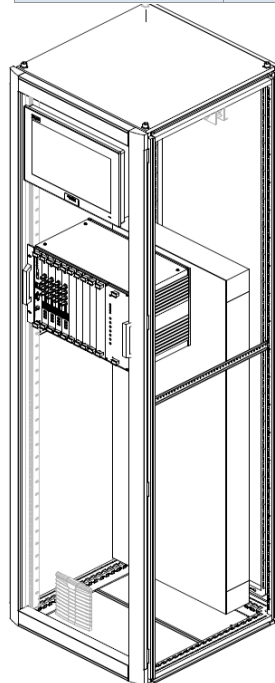
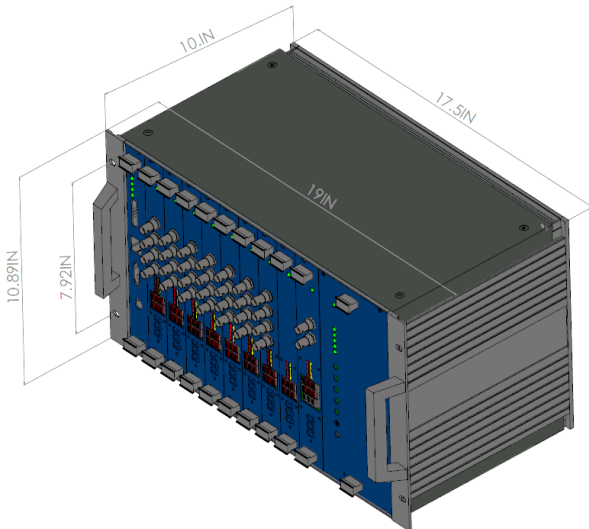
	<p>* Notes: Require a special external shunt termination resistor for 4- 20mA inputs. Refer to datasheets PDOI-ENG-V6000/V-Ver1.0 for additional details.</p>
Discrete Rack Control	<p>Two connections supporting dry contact, 24V logic are available via the PLC or DCS :</p> <ul style="list-style-type: none"> Alarm Reset (Acknowledge)* Trip Multiply <p>These can be invoked remotely by wiring suitable analog control signals. Refer to TUM-ENG-V6000-Ver1.0 for details.</p>
	<p>*Note: The Alarm Reset (Acknowledge) function is also available as a local pushbutton on the RCM faceplate.</p>
Number of Power Supplies	Accepts up to two independent power sources
Buffered Transducer Outputs	
Front Panel BNC connectors	Four BNC (female) connectors. Buffered outputs are only available from V6000/V and V6000/K channels
	Impedance
	<ul style="list-style-type: none"> 50 Ω
	Short-Circuit Protected
	<ul style="list-style-type: none"> Yes
	Signal Type
	<ul style="list-style-type: none"> Raw (unfiltered, no integration) input signal in mV/engineering units.
LEDs	
OK/Error	Each module provides an OK LED indicating that no faults or NOT OK conditions are present within the module or any channel therein.
LED for Relays	Each Module provides 8 LEDs (one for each relay) indicating that the relay is being driven true (corresponding to the configured alarm logic for each relay)
Card Status	V6000/V provides two LEDs for the correct communication between the gateway and V6000/V card.
Gateway LEDs	Modbus Slave (TX/RX)
	V6000/G provides two LEDs for each of its Modbus ports, indicating whether a connection is present and whether send/receive is active.
	Communication With Cards
	V6000/G provides two LEDs for the correct communication between the cards.

DC Power for cards	Each V6000/P/RP provides six individual status LEDs for both Power 1 and Power 2 connections. When lit, it indicates power is detected and is within specifications.
Analog Outputs	
OK Relay Contact	This relay is to indicate if any of the transducers has a power error like disconnection. This sensor error status relay may be used to be connected to PLCs, DCSs or other standard available control systems able to handle relay contact inputs.
Alarm Relays	There is one alarm relay for each analog input i.e. eight SPDT relays for each V6000/V card that can be programmed separately for each channel.
4-20 mA	There is one programmable 4-20 mA output for each input connected to V6000/V and V6000/K cards.
Digital Outputs	
Modbus RTU	There are 3 available Modbus RTU connections on the back plane of V6000/G to be connected through RS-232 and RS-485 protocols. Refer to card datasheet for further details
Condition Monitoring (TCP/IP Ethernet)	10/100/1000 BASE- connector on V6000/G provides full static and dynamic (waveform) data using an open, published TCP/IP protocol on local networks. Refer to V6000/G datasheet for further details.
Display & Keys	
Digital 7 Segment Display	High quality digital display to indicate each of the input values connected to the card back plane.

220V-AC	Each V6000/P/RP provides two LEDs for Input 220V-AC
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Display Refresh Time	Channel values and statuses are all updated once in each second.
API 670 Compatibility	V6000 system and cards are all compatible with API 670 and conform to API 670 requirements for machinery protection systems.
Channel Key	Input key to shift and browse between the selected channels for local display and configuring properties of each channel separately.
Select Key	Hold this key for one second to setup each configurable parameter of the selected channel like transducer sensitivity, alarm and trip value ...
Reset Key	Reset button located on the front panel of V6000/V cards is used to reset all alarm latched & activated relays to default state. This button is also used to change the menu pages in configuration phase.
Key lock Security	Key lock is to prevent any unauthorized access to the configuration of each card.

Environmental	
Operating Temperature	-20 °C to +60 °C
Storage Temperature	-40 °C to +80 °C
Operating Temp. Ramp	Do not exceed 0.5 °C/ minute
Storage Temp. Ramp	Do not exceed 10 °C/minute
Humidity	5% to 95%, non-condensing



Features and Benefits

- **Input Transducers**

Vibsens systems are all capable to measure and acquire signals from transducers provided by other 3rd party hardware and are fully compliant with standard monitoring systems.

- **Engineering & Services**

Vibsens presents full engineering services & solutions for factories from project management, system design to installation, commissioning, training, calibration and customer support in the field of vibration measurement & protection.

- **Integrated Condition Monitoring**

Condition monitoring data can be streamed to optional Vibsens-PRO® software online mode or read from internal storage in the server. Using a local server V6000 rack cabinet with an embedded solid-state hard drive all data gathered from inputs can be recorded to files for later data review and analysis limited by the capacity of the internal storage ordered. This powerful capability integrates a machinery protection system into a complete condition monitoring solution that ensures no loss of data in case of any machinery failures and creating a vast history archive of valuable data.

- **Well experienced team**

Vibsens team includes highly experienced staff in the field of vibration measurement and protection systems from design & development to installation and training. This ensures products manufactured and delivered to the customers to be fully compliant to the latest edition of the relative standards available in this field like ApI-670 and considering all the expectations of the instrumentation and control department and maintenance personnel in the developed hardware and software.

- **Simplified spare parts**

Based on various fields of application of vibration protection systems across the industry, our team has designed a system fully customizable for customer needs while maintaining easy setup and simplicity. Moreover, limiting the protection system cards to four types makes it easy for spare parts ordering and replacement of parts.

- **Warranty**

All of our products do come with a general warranty which ensure that products delivered to the customer are free from any defects or malfunctions in material and operation, as long as the product is used correctly. In case of any unexpected incident Vibsens feels the responsibility to repair the system in I short amount of time.

Ordering Information

V6000/RACK-AA-BB-CC-DD-EE-FF

V6000 Machinery Protection (Condition) Monitoring System

AA Gateway Module

0 0	None	V6000 as a protection system without connection ports for condition monitoring & HMI communications
0 1	Modbus-RTU ports enabled	3 Modbus-RTU ports for HMI connection
0 2	Condition Monitoring enabled	3 Modbus-RTU ports plus one Ethernet TCP/IP port for condition monitoring & HMI communications

BB Number of absolute vibration transducers *

0 0	None	<ul style="list-style-type: none"> - Card Name :V6000/V - Each V6000/V has 4 input channels - Accelerometer /Velocity transducers - IEPE /Current/Voltage modes supported - Metric /Imperial units
0 1	Less than 4 channels	
0 2	More than 4 less than 8 channels	
0 3	More than 8 less than 12 channels	
0 4	More than 12 less than 16 channels	
0 5	More than 16 less than 20 channels	
0 6	More than 20 less than 24 channels	
0 7	More than 20 less than 24 channels	

CC Number of relative shaft vibration transducers *

0 0	None	<ul style="list-style-type: none"> - Module Name :V6000/V - Each V6000/V has 4 input channels - Thrust / Displacement transducers - Positive /Negative power supply (± 24 V dc) transducers can be used - Metric /Imperial units
0 1	Less than 4 channels	
0 2	More than 4 less than 8 channels	
0 3	More than 8 less than 12 channels	
0 4	More than 12 less than 16 channels	
0 5	More than 16 less than 20 channels	
0 6	More than 20 less than 24 channels	
0 7	More than 20 less than 28 channels	

* Note : Total number of absolute and relative shaft vibration measurement cards should not exceed seven

DD Keyphasor Module

0 0	None	<ul style="list-style-type: none"> - Photoelectric / Proximity transducers are supported - Positive /Negative power supply (± 24 V dc) transducers can be used
0 1	1-4 Keyphasor® (tachometer) transducers	

EE Multifunction Module

0 0	None	<ul style="list-style-type: none"> - SPDT Relays logic program in factory
0 1	6 channel 4-20mA or 0-10v static input from process variables	

FF Power Supply

0 1	One 90 ~ 260VAC / 125 ~ 370VDC 50/60Hz supply, 250W	<p>Note: When you have UPS or other secondary power source user should order redundant power supply card.</p>
0 2	Two 90 ~ 260VAC / 125 ~ 370VDC 50/60Hz supply, 250W as redundancy power supply	

V6000/Cab -AA-BB-CC-DD
Cabinet and Engineering

AA Cabinet & Engineering

0 0	None	All cabinets are in accordance with Rittal® cabinet standard
0 1	Enclosure frame 60*60*210 cm	Recommended for one V6000 system
0 2	Enclosure frame 80*80*210 cm	Recommended for maximum two V6000 systems
0 3	Enclosure frame 80*80*210 cm (swing door)	Vibsens recommended cabinet
0 4	Customer specific requirements	Hazardous areas: Please contact us for explosion-proof versions or consultancy on installation.

BB Door Type

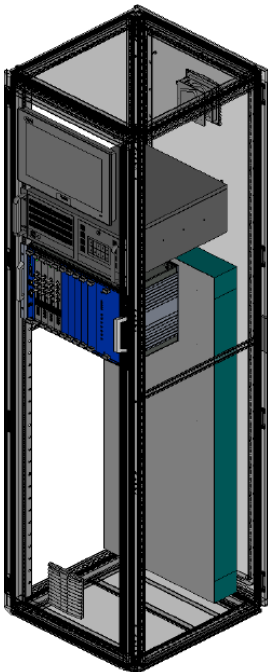
0 1	Solid Door	
0 2	Cutting for Industrial Panel PC (IPC), transparent glass door or special cut for visual check of the front panel indicators	- Glass door : the front face of the cabinet is made from glass so that user can see the status of front indicators of V6000 (values, status LEDs, relay states)
0 3	Customer specific requirements	

CC Air conditioning system

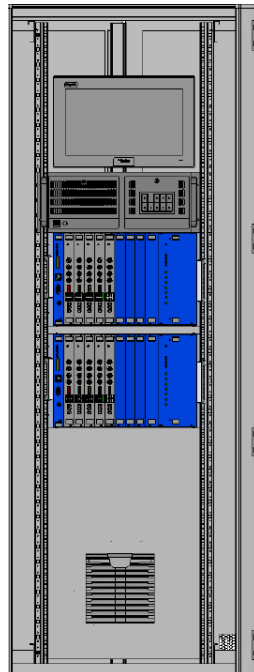
0 0	None	
0 1	Heating system	- Heating system is a cost-effective solution for high humidity applications
0 2	Cooling system	

DD UPS

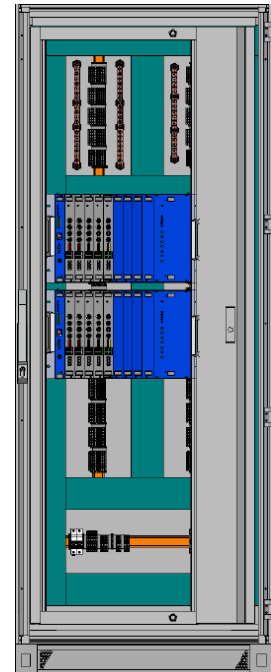
0 0	None	
0 1	UPS connection	- Total energy needed for safe operation is calculated and declared to the customer



60*60*210 cm



80*80*210 cm



Swing Door

V6000/ACC -AA-BB-CC-DD-EE

Accessories and tools

AA Server

0	0	None	Minimum requirements for server PC is in the following: - 2.2 GHz multi-core 32/64 bit processor - 4 GB of system memory - At least 200 GB of available hard disk space, - Gigabit Ethernet network interface adapter
1	X	Desktop PC	
2	X	19" Industrial PC	
3	x	Industrial Panel PC (IPC) mounted on the cabinet front wall	

BB Communication Adapter

0	0	None	- X: Number of converter - Protocol conversion between Modbus-RTU and TCP/IP and PROFIBUS
1	X	Modbus-RTU to TCP/IP converter	
2	X	Modbus-RTU to PROFIBUS converter	

CC Rs-232 to RS-485 Adapter

1	X	Rs-232 to RS-485 Adapter	- X: Number of adapter For connection to IPC / PPC or DCS
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DD Hub Switch

0	0	None	- Depending on network traffic to share data from several V6000 protection systems to different servers & clients
0	1	8 Port Hub Switch	

EE Junction BOX

0	0	None	- X: Number of JB - Depending on the number of Transducers and P&ID -
1	X	Polycarbonate enclosure	
2	X	Stainless steel enclosure	
3	X	Galvanize steel enclosure	

FF Probe Assembly

0	0	None	- X: Number of Probe Assembly
X	X	Eddy Current Probe Assembly	



WARNING:

V6000 system is shipped with default factory settings to the customer which maybe is not the optimal settings for all industrial applications. Customer can send the required settings to Vibsens before shipment so that Vibsens staff customize all the settings of the product for easy installation by the customer. Alternative solution is that Vibsens sends one of its engineers to perform this on site.