

Cell Voltage Monitor

32-channel cell voltage monitor module and sets for H₂ fuel-cell stacks

CVM-32A series





Product Description

A cell voltage monitoring (CVM) system tailored for research, testing and practical application of H₂ fuel cells. The CVM system protects the integrity of individual cells and provides valuable data for predictive maintenance planning and performance optimization.

CVM-32A modules and sets are designed as a cost-effective solution mainly for hydrogen fuel cells applications with limited voltage range.

These ready-to-use cell voltage monitor sets are easily integrated into specialized applications and allow direct connection to a PC via **USB** or to a PLC via **RS-485** bus.

Explore our precision 2.5 V solutions with the **CVM-64H** module and sets, or 5 V solutions with the **CVM-24P** module and sets. For broader temperature and voltage monitoring requirements, consider our **TEVOMET** solutions.

Contact our sales team at sales@kolibrík.net for customized CVMs to meet your specific requirement.

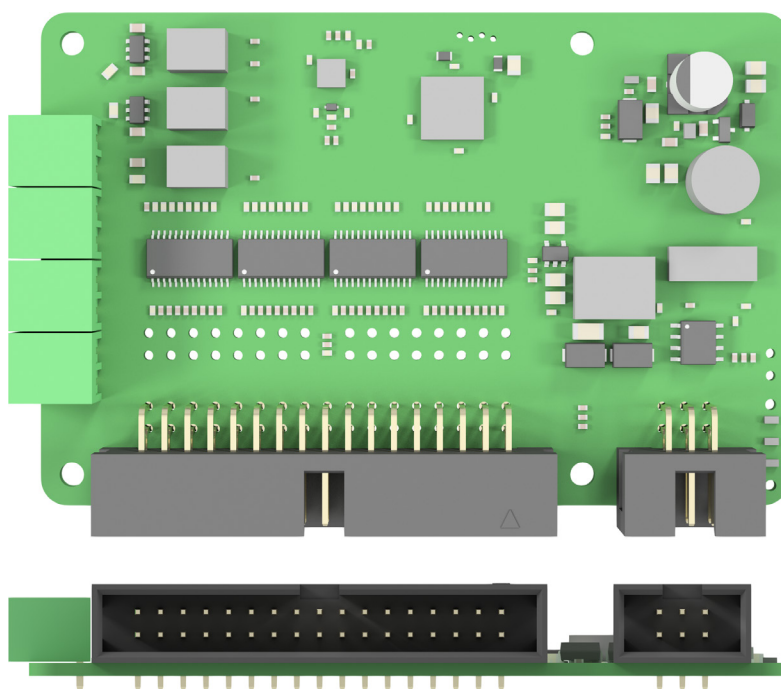
Technical Parameters

Channel count	32 channels per one CVM-32A module
Channel voltage range	± 1.5 V
Input impedance	> 100 MΩ
Isolation	< 500 V between channels and XC2 bus Additional up to 1 kV isolation can be provided by adding of a controller modules
Sampling	Channel multiplexing in selected range of used channels 12-bit ADC with up to 1 Msps internal sampling All-channel sample rate up to 100 sps
Accuracy	0.1% of range + 0.1% of reading
Cell connection	34-pin IDC connector (automotive-grade connectors on request)
Communication bus	RS-485: XC2 / Modbus RTU Optional CAN bus and Modbus TCP communication with additional gateways Compatible with other Kolibrík modules
Inputs / outputs	Opto-isolated I/O with serial communication capability
Power supply	5 V DC / < 100 mA fom XC2 bus 8 ... 30 V DC with Power supply module KMS-PWR



<p>Dimensions</p>	<p>CVM-32A module without enclosure CVM-S32A ... CVM-S640A CVM-E32A</p>	<p>85 x 58 x 13.5 mm 90 x 61 x (n¹ x 16 + 24) mm 90 x 61 x 16 mm <small>*) n - number of 32-channel modules</small></p>
<p>Mounting</p>	<p>DIN-rail and wall-mount holders for set enclosures Single module without enclosure: 4x mounting hole 2.7 mm, hex spacers with M2.5 thread</p>	
<p>Channel count examples</p>	<p>Single CVM-32A module CVM-S32A CVM-S64A CVM-S160A CVM-E32A</p>	<p>32 channels 32 channels 64 channels 160 channels additional 32 channels</p>
<p>Multiple modules can be daisy-chained to measure up to 640 channels, custom sets for more channels available</p>		
<p>Ambient operating temperature</p>	<p>-40 °C to +85 °C +85 °C to +125 °C module can be powered, measurement inactive</p>	

*) Channels are organized by groups of 4 channels. Channels in one group can measure up to ±20 V if the sum of group channels does not exceed 20 V. So, one channel can measure up to ±20 V, if other channels in group are short-circuited. Note that adjacent channels and groups are chained together and are not independent.



CVM-32A module



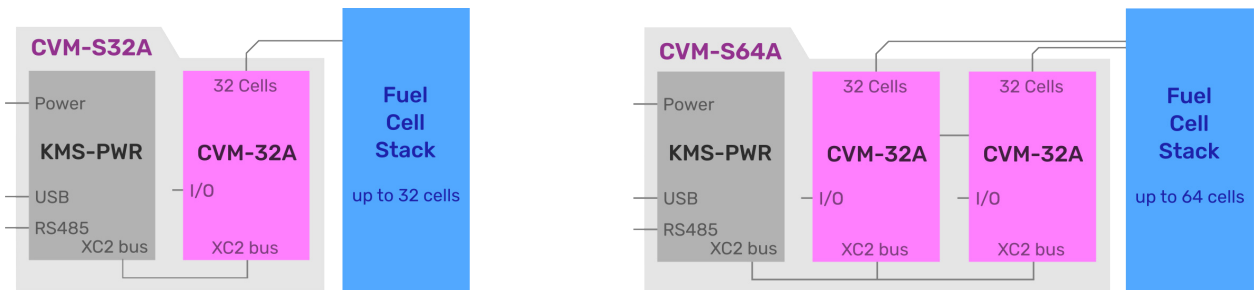
System Modularity

Cell voltage monitoring system set

- One power and communication module KMS-PWR
- Number of 32-channel modules CVM-32A, depending on number of channels needed
- Up to 640 channels with step of 32

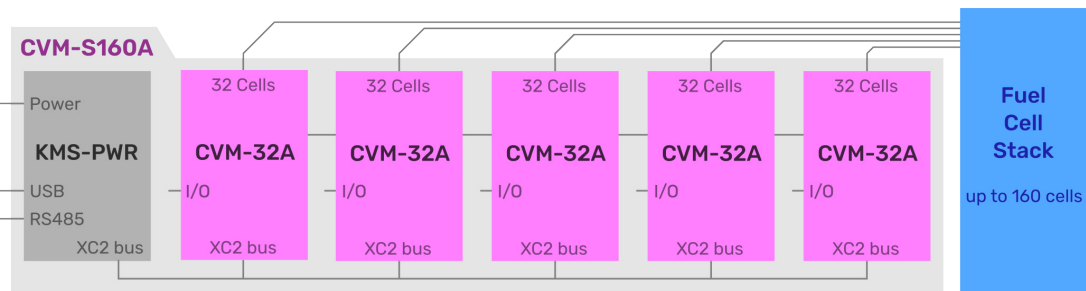
For high amount of modules, power supply distribution and isolation voltage must be considered. Maximum recommended length for those sets is 20 modules. For more channels, more sets can be chained.

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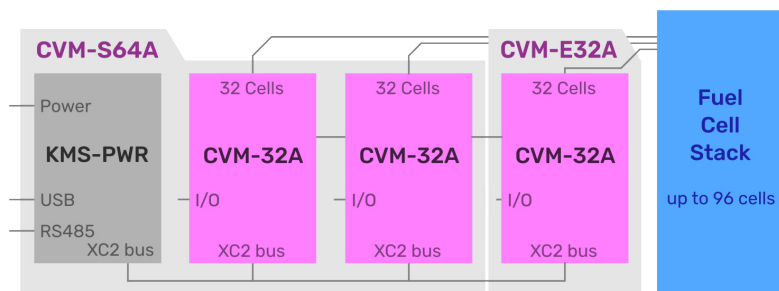


Block scheme of modules in 32-channel **CVM-S32A**

Block scheme of modules in 64-channel **CVM-S64A**



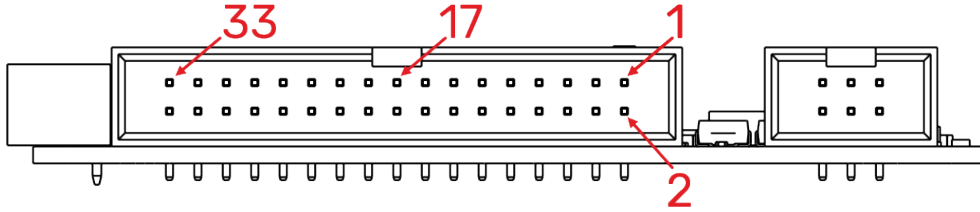
Block scheme of modules in 160-channel **CVM-S160A**



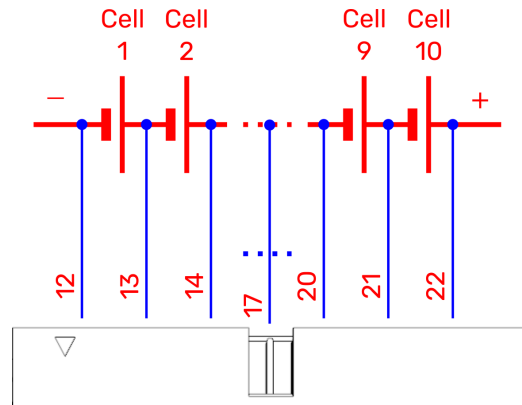
Example of 96-channel monitoring system made by extending **CVM-S64A** by an extension **CVM-E32A**



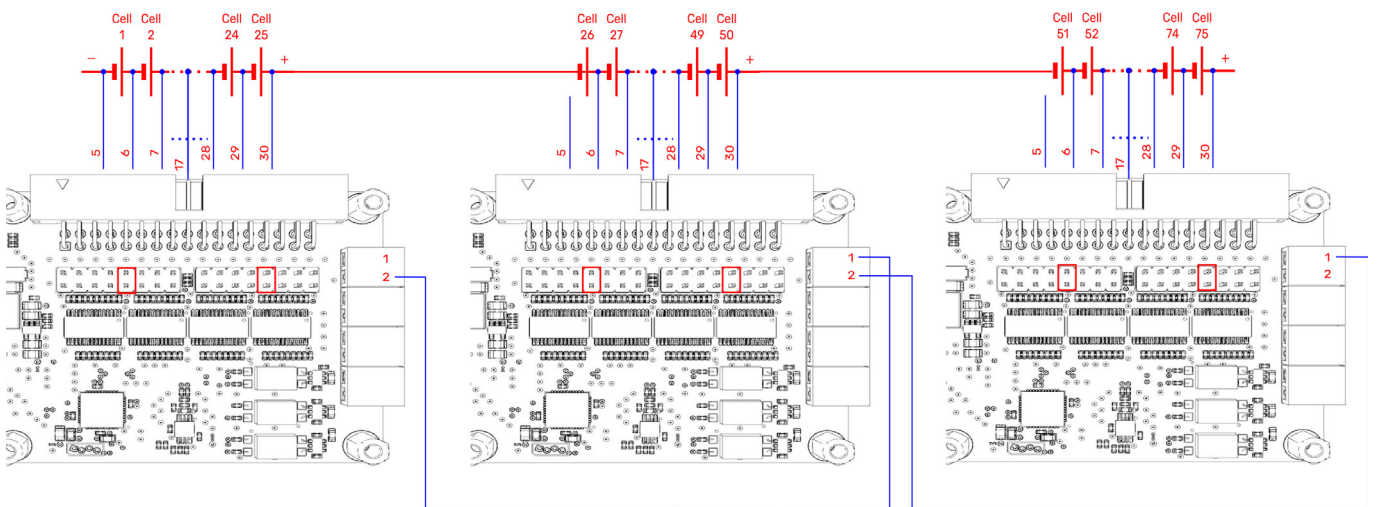
Cell Connection



Pinout description of **CVM-32A** channel connector



Example of 10-channel cell connection
Pin 17 has to be always approximately in the middle of voltage potential



Example of 75-channel connection with chaining
3 CVM-32A modules (3x25 cells)

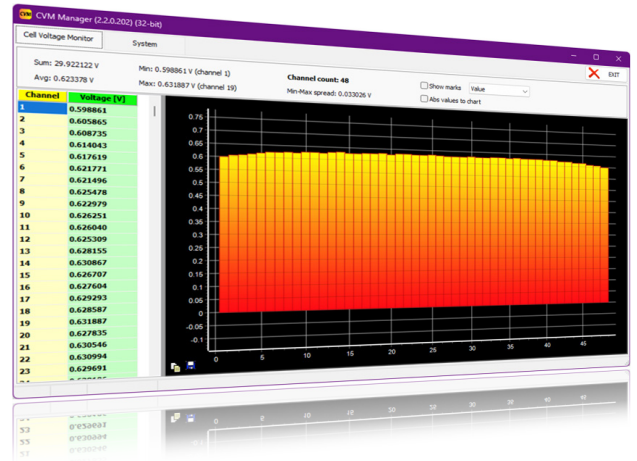


Integration Options

This section outlines various methods for integrating and utilizing the functionalities of KolibriK.net CVM system. Each method is supported by relevant visual aids to enhance understanding and ease of application.

- Integration via CVM Manager**

Automated Application CVM Manager facilitates real-time monitoring and configuration through its sophisticated interface, which allows users to log data seamlessly and visualize it through dynamic charts.



- REST API Server Access via CVM Manager**

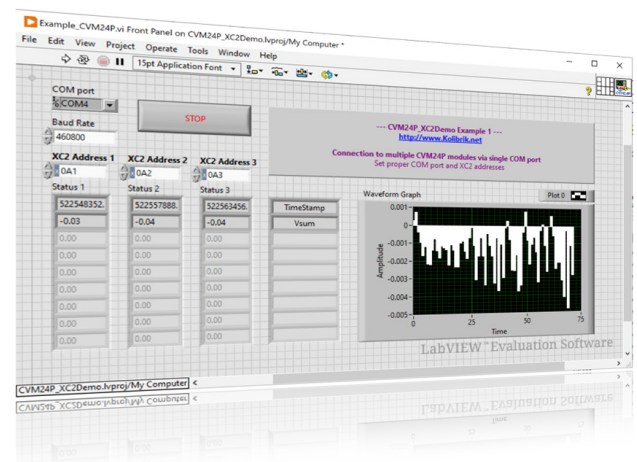
CVM Manager also supports a REST API server, readily accessible within the local network. This server allows the execution of standardized HTTP requests, simplifying the process of data retrieval and control.

- Modbus RTU Communication**

The CVM32A device can be configured to operate in Modbus RTU mode, serving as a client within the Modbus network. This facilitates robust and reliable data exchange over this industry-standard protocol.

- Integration with LabView**

Data acquisition and instrument control can be achieved through LabView, using either a direct TCP connection from CvmManager or through serial communication, offering flexible integration options.





- **Python Library for Custom Scripting**

A dedicated Python library is available, providing developers with the tools to create custom scripts for data handling and device interaction. This library enhances the programmability and versatility of the integration.

```
13 async def main():
14     # Communication settings
15     baud_rate = 1000000
16     cvm32a_address = 0xA1
17
18     # Establish connection with COM port
19     my_ports = discover_serial_ports()
20     bus_sn = get_serial_from_port(my_ports[0])
21     my_bus = SerialBus(bus_sn, port=my_ports[0], baud_rate=baud_rate, protocol_type=ProtocolEnum.XC2)
22     await my_bus.connect()
23
24     # Creating an instance of CVM24P device
25     my_device = XC2Cvm24p(my_bus, cvm32a_address)
26
27     # Reading structure of the registry
28     await my_device.initial_structure_reading()
29
30     await my_device.read_reg_by_name('ch_avg_V')
31     print(f"Register ch_avg_V: {my_device.get_reg_by_name('ch_avg_V')}") # averaged channels values
32
33
34 if __name__ == "__main__":
35     asyncio.run(main())
36
37 #! usage == "python main.py"
38
39 #! Usage: python main.py
40 #! Usage: python main.py --baud_rate 1000000 --cvm32a_address 0xA1
41 #! Usage: python main.py --baud_rate 1000000 --cvm32a_address 0xA1 --protocol_type XC2
42 #! Usage: python main.py --baud_rate 1000000 --cvm32a_address 0xA1 --protocol_type XC2 --port COM1
```

- **Modbus TCP via External Gateway**

For environments requiring Modbus TCP communication, an external gateway such as the RPi kit can be utilized. This setup allows the system to connect with TCP networks, expanding its compatibility and application scope.

- **CAN bus via External Gateway**

For environments requiring CAN bus communication, our external gateway can be utilized. This setup is adding XC2 bus master (ECU with CAN interface) to the stack, allows the system to transmit the channel voltage values through CAN bus.

- **Smart integration with Raspberry Pi**

With the flexibility of Raspberry Pi, you can develop and implement custom scripts and applications that tailor the monitoring system to you specific needs. You can access, collect and process real-time data and make adjustments remotely to enhance operational safety and efficiency.





Educational and Development Opportunities

The use of Raspberry Pi encourages educational institutions and researchers to engage with real-world data and system management challenges. This can foster innovation and development of new technologies and methodologies in the field of energy systems monitoring.

These integration methods ensure that users can customize their experience to meet specific requirements and preferences, leveraging the full capabilities of our technology in a variety of operational contexts.



Ordering Information examples

<p>CVM-S32A</p> <p>Power source KMS-PWR; 1x CVM-32A 32 channels total Out of Box Solution</p>	
<p>CVM-S64A</p> <p>Power source KMS-PWR; 2x CVM-32A 64 channels total Out of Box Solution</p>	
<p>CVM-S160A</p> <p>Power source KMS-PWR; 5x CVM-32A 160 channels total Out of Box Solution</p>	
<p>CVM-E32A</p> <p>Extension for assembly set; 1x CVM-32A 32 additional channels Extension for set</p>	

CVM Set Package Contains

- 1x KMS-PWR; n^{*)} x CVM-32A; 1x DC Power connector; 1x USB cable;
- 1x XC2 bus cable; n^{*)} x clamps for I/O, CAN and chaining; DIN rail holders

*) n - number of 32-channel modules

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