

# Cell Voltage Monitor

64-channel cell voltage monitor module and sets for H<sub>2</sub> fuel-cell stacks

CVM-64H series





## Product Description

A cell voltage monitoring (CVM) system tailored for research, testing and practical application of H<sub>2</sub> fuel cells. The CVM system protects the integrity of individual cells and provides valuable data for predictive maintenance planning and performance optimization.

Adapted for research and testing purposes, the **CVM-64H** system offers excellent accuracy and is designed primarily for hydrogen fuel cells and smaller electrolyzers.

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** or **CAN** bus.

Explore our precision 5 V solutions with the **CVM-24P** module and sets, or opt for the cost-effective **CVM-32A** module and sets. For broader temperature and voltage monitoring requirements, consider our **TEVOMET** solutions.

Contact our sales team at [sales@kolibrík.net](mailto:sales@kolibrík.net) for customized CVMs to meet your specific requirement.

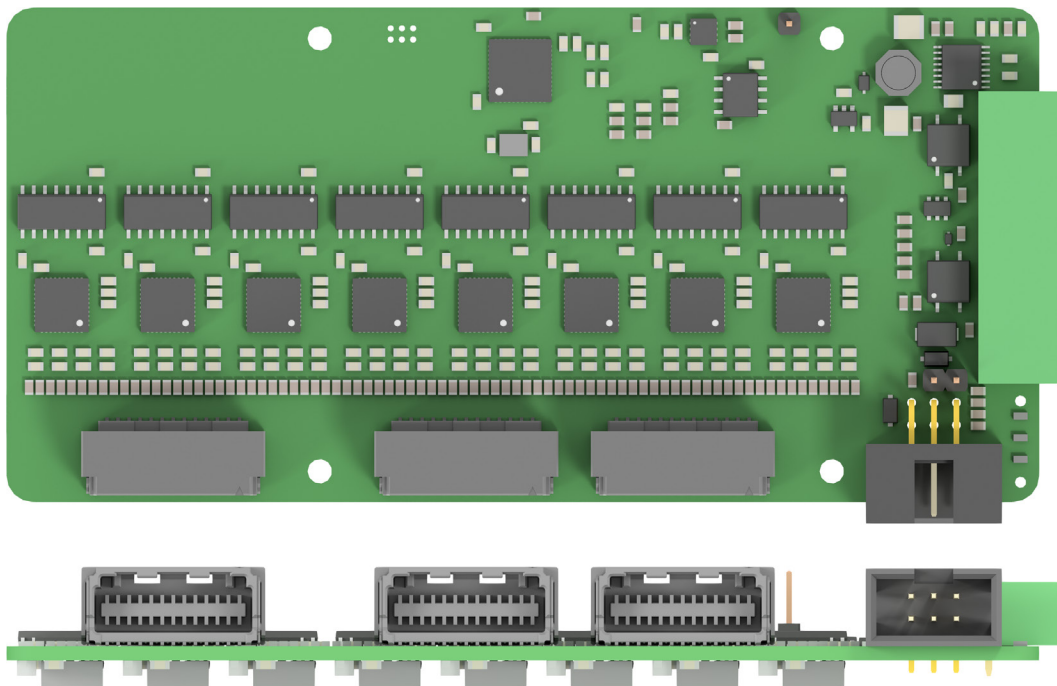
## Technical Parameters

Channel count	64 channels per one CVM-64P module
Channel voltage range	± 2.5 V
Input impedance	≥ 1 MΩ
Isolation	1 kV between channels and power supply + communication bus Additional isolation can be provided by isolating bus segments
Sampling	Precise 24-bit ADCs, all-channel sample rate up to 250 sps
Accuracy	0.02% of range + 0.05% of reading
Cell connection	26-pin Molex Micro-Lock Plus connector
Communication bus	RS-485: XC2 / Modbus RTU CAN bus Compatible with other Kolibrík modules
Inputs / outputs	Opto-isolated I/O with serial communication capability
Power supply	7 ... 33 V DC / 2.2 W max
Application examples	H <sub>2</sub> fuel-cell tests stands H <sub>2</sub> fuel-cell application monitoring Electrolyzers monitoring Control systems



<p>Dimensions</p>	<p>CVM-64H module without enclosure CVM-S64H ... CVM-S1280H CVM-E64H</p>	<p>117 x 58 x 13.5 mm 122 x 61 x (n*) x 16 + 24) mm 122 x 61 x 16 mm *) n - number of 64-channel modules</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-64H module CVM-S64H CVM-S128H CVM-S320H CVM-E64H</p>	<p>64 channels 64 channels 128 channels 320 channels additional 64 channels</p> <p>Multiple modules can be daisy-chained to measure up to 1280 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-64H** module



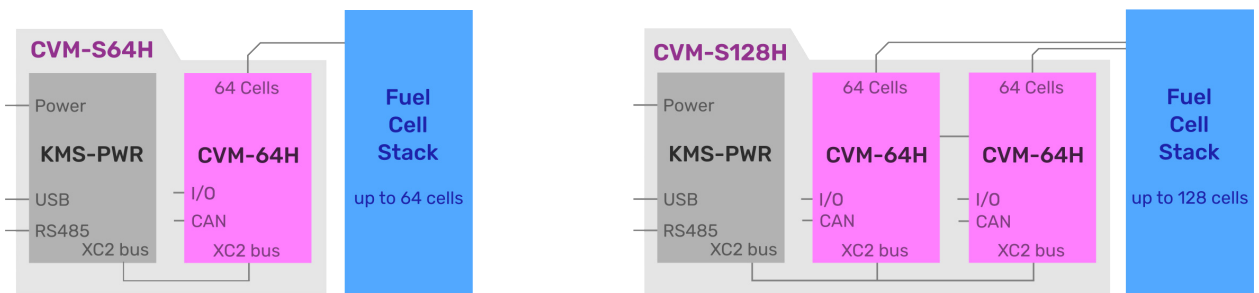
# System Modularity

## Cell voltage monitoring system set

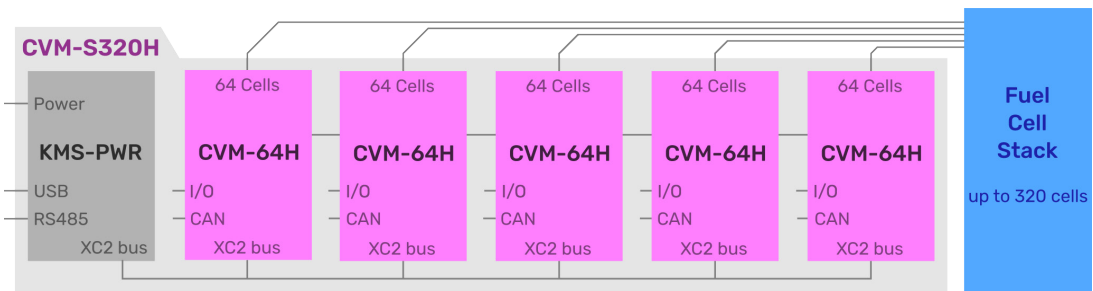
- One power and communication module KMS-PWR
- Number of 64-channel modules CVM-64H, depending on number of channels needed
- Up to 1280 channels with step of 64

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.

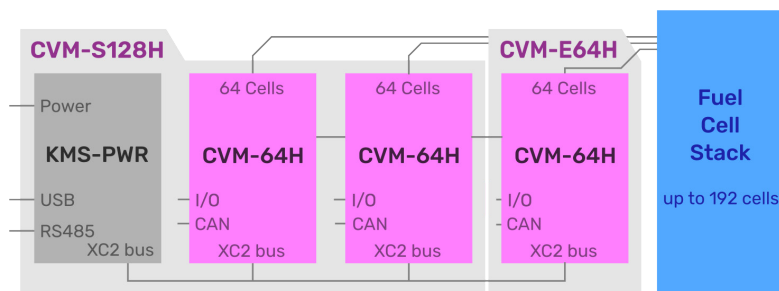
Contact our sales team at [sales@kolibrík.net](mailto:sales@kolibrík.net) for customized solutions.



Block scheme of modules in 64-channel **CVM-S64H**    Block scheme of modules in 128-channel **CVM-S128H**



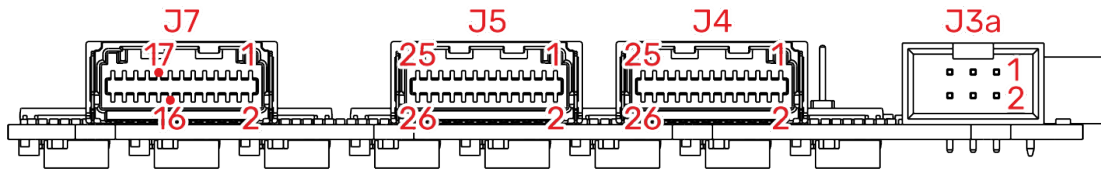
Block scheme of modules in 320-channel **CVM-S320H**



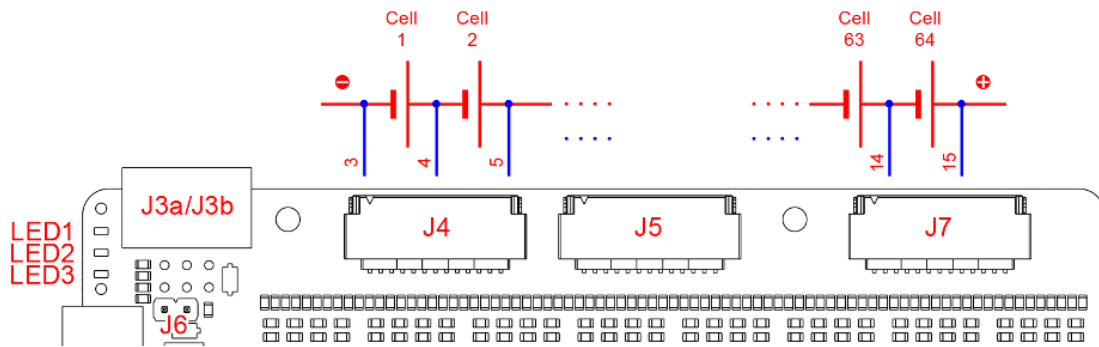
Example of 192-channel monitoring system made by extending **CVM-S128H** by an extension **CVM-E64H**



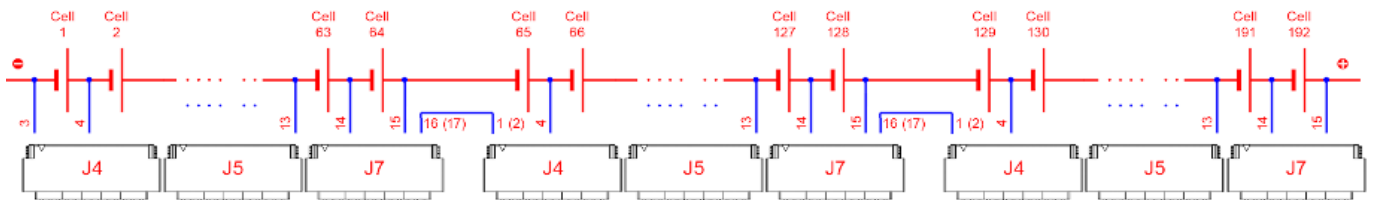
# Cell Connection



Pinout description of **CVM-64H** channel



**CVM-64H** connection of 64 cells



Example of 192-channel connection with chaining **3 CVM-64H** modules

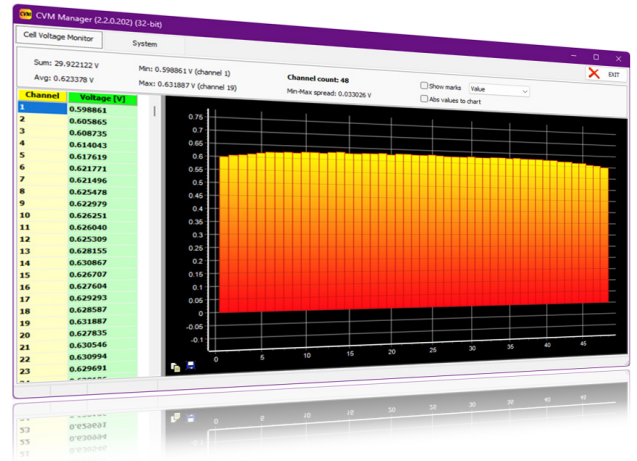


# Integration Options

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**

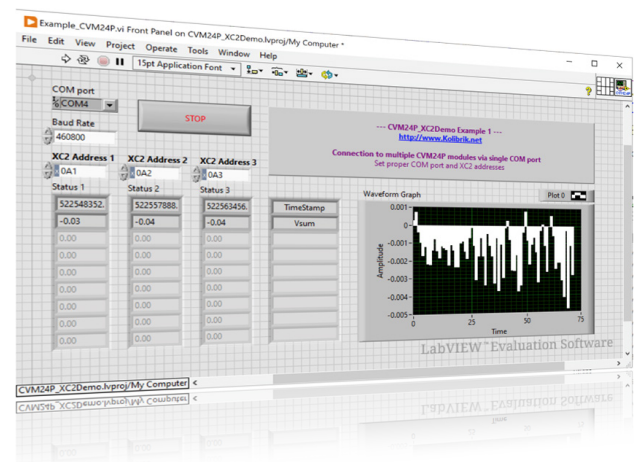
CVM Manager also supports a REST API server, readily accessible within the local network. This server allows the execution of standardized HTTP requests, simplifying the process of data retrieval and control.

- 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 [options]
40 #! Options:
41 #! -h, --help            show this help message and exit
42 #! -baud BAUD_RATE, --baud BAUD_RATE
43 #!                        baud rate (default: 1000000)
44 #! -port PORT, --port PORT
45 #!                        port (default: /dev/ttyUSB0)
46 #! -protocol PROTOCOL, --protocol PROTOCOL
47 #!                        protocol type (default: XC2)
48 #! -address ADDRESS, --address ADDRESS
49 #!                        device address (default: 0xA1)
50 #! -device DEVICE, --device DEVICE
51 #!                        device name (default: XC2Cvm24p)
```

- **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.

- **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 your 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-S64H</p>	<p>Power source KMS-PWR; 1x CVM-64H 64 channels total Out of Box Solution</p>	
<p>CVM-S128H</p>	<p>Power source KMS-PWR; 2x CVM-64H 128 channels total Out of Box Solution</p>	
<p>CVM-S320H</p>	<p>Power source KMS-PWR; 5x CVM-64H 320 channels total Out of Box Solution</p>	
<p>CVM-E64H</p>	<p>Extension for assembly set; 1x CVM-64H 64 additional channels Extension for set</p>	

## CVM Set Package Contains

- 1x KMS-PWR; n<sup>\*)</sup> x CVM-64H; 1x DC Power connector; 1x USB cable;
- 1x XC2 bus cable; n<sup>\*)</sup> x clamps for I/O, CAN and chaining; DIN rail holders

<sup>\*)</sup> n - number of 64-channel modules

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