



VIO System, centralized measuring system with the additional something

CSM Web-Seminare

CSM **Xplained**
measurement technology



Innovative Measurement and Data Technology

Stronger Together



- ▶ Software focused for the automotive industry
 - ▶ development of distributed systems (PREEvision)
 - ▶ ECU development and testing (e.g. AUTOSAR and CANoe)
 - ▶ Diagnostics (e.g. CANdelaStudio)
 - ▶ ECU Calibration and Measurement (e.g. CANape and vMeasure)
 - ▶ Interfaces to busses and ECU (e.g. VN, VX1000)
 - ▶ Data Loggers (GL and Smart Logger)
 - ▶ Testing hardware (VT System)
- ▶ Robust and reliable analog measurement modules
 - ▶ CAN based MiniModules (e.g. THMM)
 - ▶ ECAT high speed modules (e.g. AD4 IG1000)
 - ▶ HV safe measurement modules (e.g. HV DTemp)
 - ▶ Data Loggers (UniCAN3)

Stronger Together

VECTOR



- ▶ Software focused for automotive industry
 - ▶ development of integrated systems (PREEvision)
 - ▶ ECU development and testing (e.g. AUTOSAR and CANoe)
 - ▶ Diagnostic tools (e.g. InStudio)
 - ▶ ECU Calibration and measurement (e.g. CANape and vMeasurement)
- ▶ Interfaces to various ECUs (e.g. CAN, LIN, FlexRay, etc.)
- ▶ Data Loggers (e.g. UniLog and Smart Logger)
- ▶ **Testing hardware (VT System)**




- ▶ Robust and reliable analog measurement modules
 - ▶ **CAN based MiniModules (e.g. THMM)**
 - ▶ **ECAT high speed modules (e.g. AD4 IG1000)**
 - ▶ HV safe measurement
- ▶ Data Loggers (UniLog)



Low cost, compact, high channel analog measurement and testing hardware for testbench and desk application

VIO System

- ▶ Modular I/O testing and measuring system
 - ▶ Reasonable price tag
 - ▶ Seamlessly integrated in our software tools CANoe, CANape and vMeasure
 - ▶ PTP (IEEE1588) synchronized to further system and the measurement PC
- 
- ▶ Starting point was our VX1161 measurement and calibration hardware
 - ▶ Up to 12 VIO System measurement and testing cards per housing
 - ▶ Up to 336 channel per unit
 - ▶ Configurable to your use-case. Extend the application of the VIO System from analog to bus and ECU testing and measurement tasks.
 - ▶ Operating temperature ranges from -20 to 60°C.

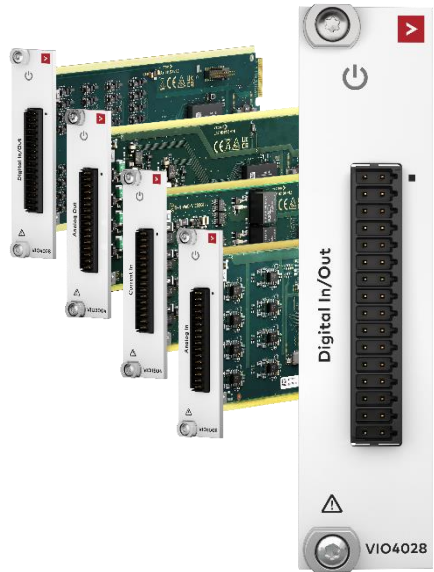
VIO System Toolbox



- ▶ **VX1161.11**
Power-Supply card
(125 W)
- ▶ **VIO8904**
Standard-Power
Supply card (40 W)



- ▶ **VX1161.22B**
Host-Uplink card
(2x10Gbit/s; 4x1Gbit/s)
- ▶ **VIO6020**
Standard-Host Uplink card
(3x1 Gbit/s)



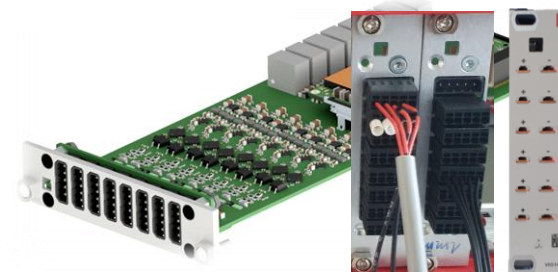
- ▶ **VIO4028**
Universal Digital I/O card
(28 Inputs/ Outputs)
- ▶ **VIO2004**
Stimulation card
(4 Outputs)
- ▶ **VIO1804**
Current measurement card
(4 Inputs)
- ▶ **VIO1008**
Voltage measurement card
(8 Outputs)



- ▶ **VIO9012** (12 slots)
- ▶ **VIO9007** (7 slots)



- ▶ **VX1161.41B**
Interface card
(6x CAN/CAN-FD; 1x
FlexRay)
- ▶ **VX1161.41A**
Interface card
(6x CAN/CAN-FD)



- ▶ **VIO1208A.MT**
Voltage/Current measurement card
(8 Inputs)
- ▶ **VIO1254A.MT**
Voltage/IEPE/Ratiometric high speed
measurement card
(4 Inputs)
- ▶ **VIO1406A.MT**
Thermocouple measurement card
(6 Inputs)

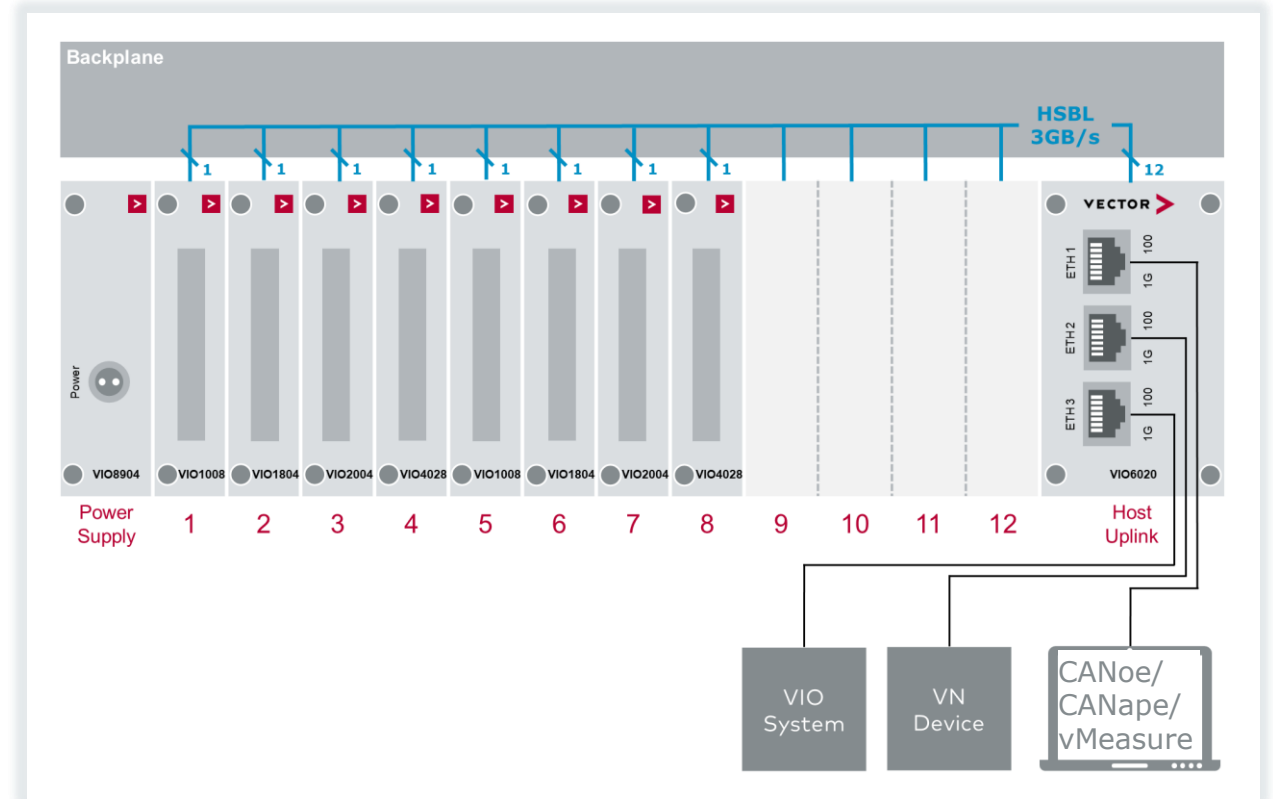
It also works with VX1161



- ▶ Extend the functionality of your VX1161 with VIO and VIO.MT analog measurement and testing cards
 - ▶ Support for up to six cards in total, VX and VIO cards!
 - ▶ Full functional support
 - ▶ No additional hardware required

Hardware Concept

- ▶ The VIO System is connected to the PC running CANoe/ CANape/ vMeasure with a 1Gbps Ethernet connection.
- ▶ Synchronization with VIO System is realized using PTP mechanism (IEEE1588).
 - ▶ VIO Systems provide PTP leader/follower functionality
 - ▶ Drivers available to realize PTP follower functionality on your standard PC.
- ▶ The Uplink Card is equipped with switched Ethernet ports
 - ▶ For PC connection
 - ▶ cascading of VIO Systems
 - ▶ connection of additional hardware (VN Interfaces, CSM modules, ...)
- ▶ Each I/O card has its own individual 3 Gbps link to the Uplink Card



VIO System - General Purpose I/O Cards

Card Name / Type	Channels	Signal Type	Level	Meas. Data Rate [ms]	Sampling Rate [kS/s]	Resolution / Bandwidth
VIO1008 Voltage In	8	Differential In	+/- 5V +/- 20V +/- 60V	0.1 ... 1000	200	16bit
VIO1804 Current In	4	Differential In	+/- 100mA +/- 1A +/- 5A	0.1 ... 1000	250	16bit
VIO2004 Voltage Out / Current Out	4	Singled Ended Out	+/- 10V	---	Settling Time (Voltage) 200 us	16bit
		3-Pin Out Signal, (V _{ext}), GND	0...20mA	---	Settling Time (Current) 450 us	16bit
VIO4028 Digital I/O <i>...thereof</i> <i>...thereof</i>	28	Singled Ended Dig. I/O	(see below)	(see below)	(see below)	(see below)
	28 Inputs	Digital or PWM Input	5V	0.1 ... 1000	20.000	BW: 200 kHz
	28 Outputs	28 Digital Outputs 16 PWM Outputs	3.3V / 5V	---	20.000	BW: 25 kHz

VIO.MT System - Measurement Cards Overview

Card Name / Type	Channels	Signal Type	Level	Meas. Data Rate [ms]	Sampling Rate [kS/s]	Resolution / Accuracy
VIO1208A.MT ▶ Voltage In ▶ Current In	8	Galvanically isolated: Channel to channel, Channel to supply	+/- 100mV +/- 1V +/- 10V +/- 60V	0.1 0.2 0.5 ...	10	16bit / ~ 0.05%
			4...20mA	1000		
		Sensor excitation	5V, 7.5V, 10V, 12V, 15V	n/a		
VIO1254A.MT ▶ Voltage In ▶ IEPE ▶ Ratiometric	4	Galvanically isolated: Channel to channel, Channel to supply	+/- 100mV +/- 1V +/- 10V +/- 60V	0.005 0.01 0.02 ...	200	16bit / ~ 0.05%
		IEPE Constant current 4mA		1000		
		Full bridge 4-wire feedback	+/- 10mV/V +/- 20mV/V ... +/- 1V/V			
		Sensor excitation	5V, 7.5V, 10V, 12V, 15V	n/a		
VIO1406A.MT Thermocouple	6	B, E, J, K, N, R, S or T	Note: CJC by channel	100 200 500 1000	0.01	24bit / ~0.15C

Comparison of VIO and VIO.MT Cards

	VIO	VIO.MT
Dedicated Use Case	Testing (CANoe)	Measuring (CANape/vMeasure)
Connectors	Sum connector for all channels	Separate connector for each channel
Signal Output	Yes, e.g. VIO2004 and VIO4028	No
Meas. Data Rate	0.1 to 1000ms	Configurable between 0.005 to 1000ms
Sensor Excitation	No	Yes, e.g. VIO1208 and VIO1254
TEDS support	No	Planned
Galvanic Insolation	No	Yes
Switching measurement observable	No	Yes
Software based filter on Hardware	No	Yes
Calibration	Optional	Yes

VIO and VIO.MT Card for All

Testing (CANoe)



VIO1008
VIO1804
VIO2004
VIO4028

VIO1208.MT
VIO1254.MT
VIO1406.MT

Measuring (CANape/ vMeasure)



VIO1208.MT
VIO1254.MT
VIO1406.MT

VIO1008
VIO1804
VIO2004
VIO4028

VIO and VIO.MT
cards support
both use-cases

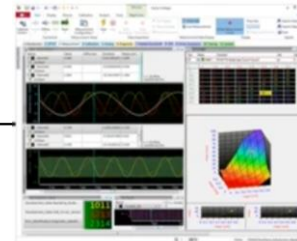
CANape and vMeasure: Device Configuration vs. Measurement Configuration



Device Configuration:

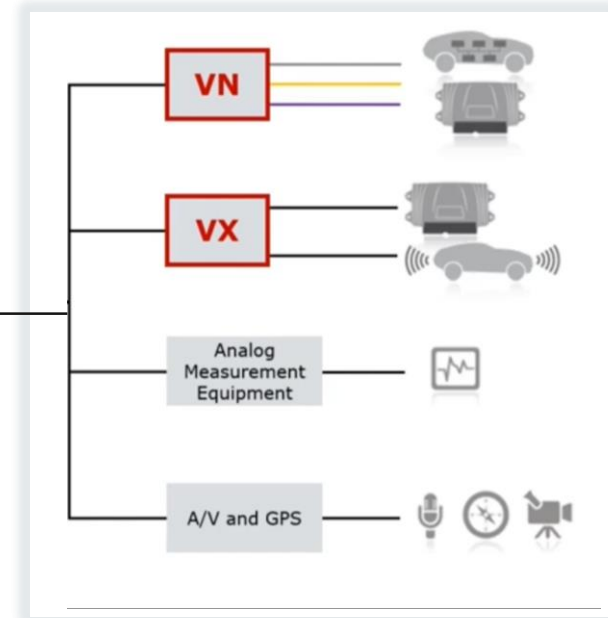
- ▶ Configuration of the link between software and hardware.
- ▶ Use of different drivers depending on the hardware and its interfaces
- ▶ Configuration of the communication protocol
- ▶ Encrypted communication

CANape / vMeasure

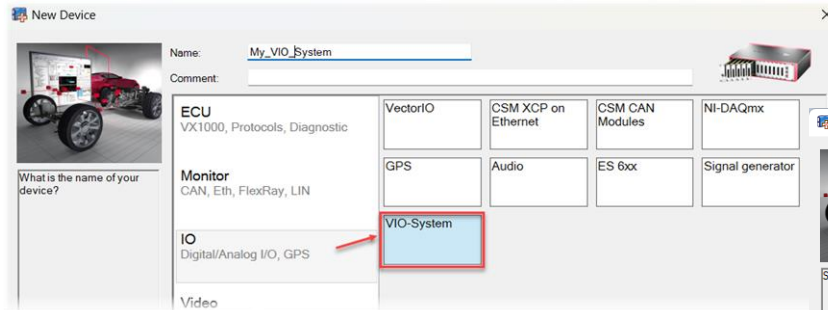


Measurement configuration:

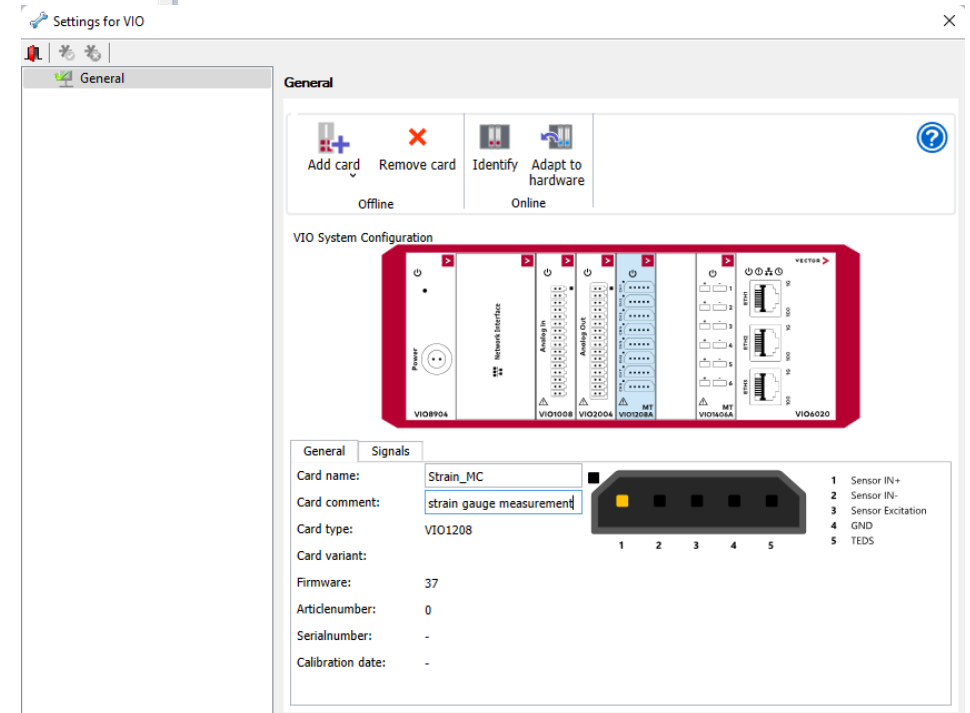
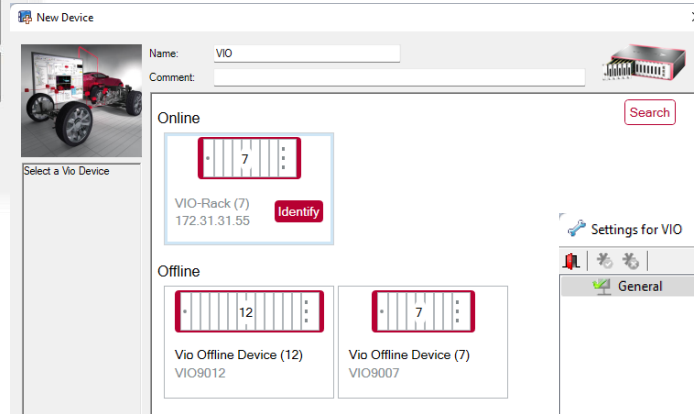
- ▶ Configuration of the measurement itself:
 - ▶ Which signals shall be recorded?
 - ▶ At which rate?
 - ▶ Shall they be further computed, e.g. filtered, manipulated, statistically evaluated,...?
- ▶ Visualization of data



CANape and vMeasure: Device Configuration

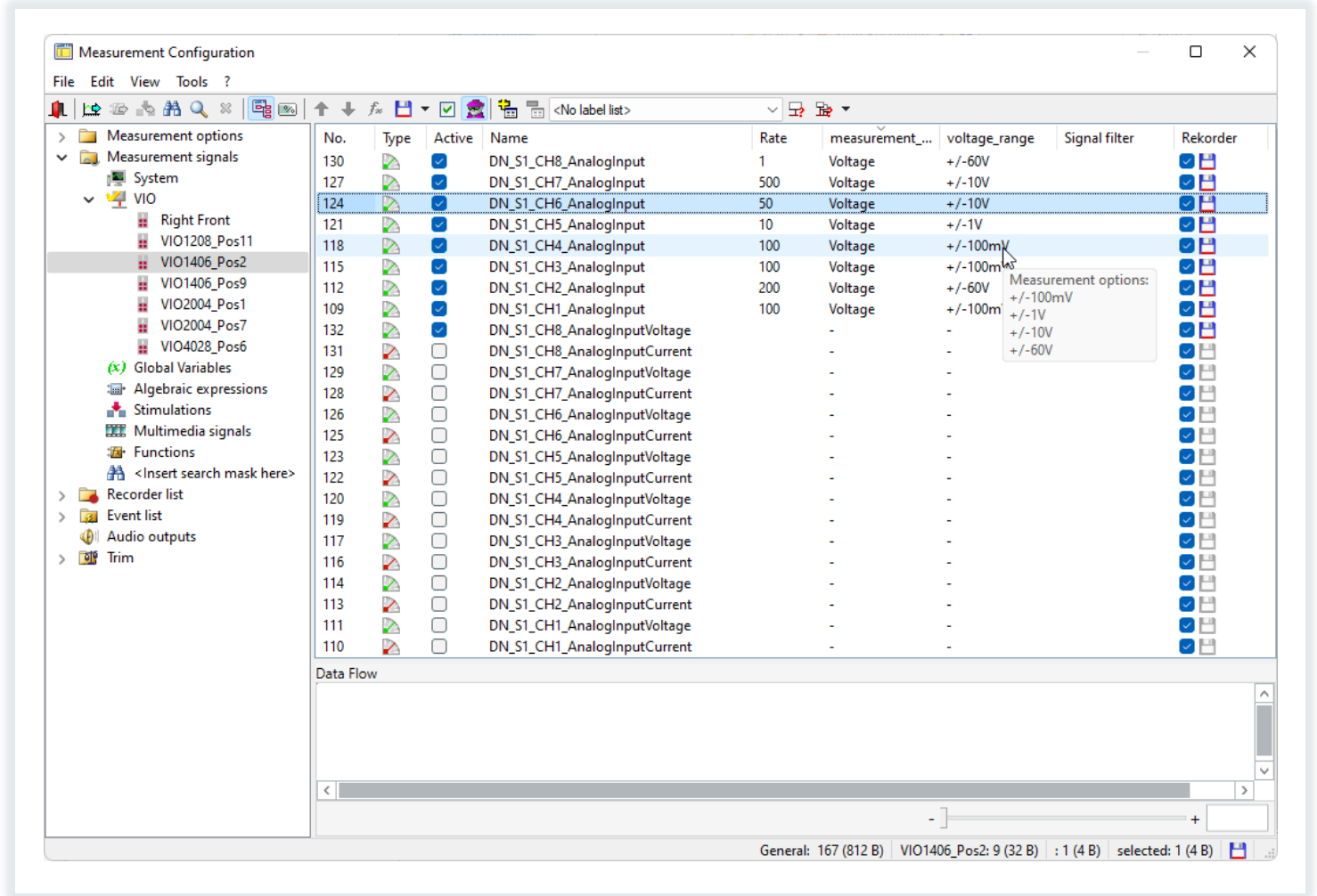


- ▶ Scan for connected VIO Systems
- ▶ Display the VIO System with all its cards at the respective position
- ▶ Detailed information for selected cards:
 - ▶ User given name for the card
 - ▶ User given comment
 - ▶ Card specific information, e.g. type and serial number
 - ▶ PIN layout

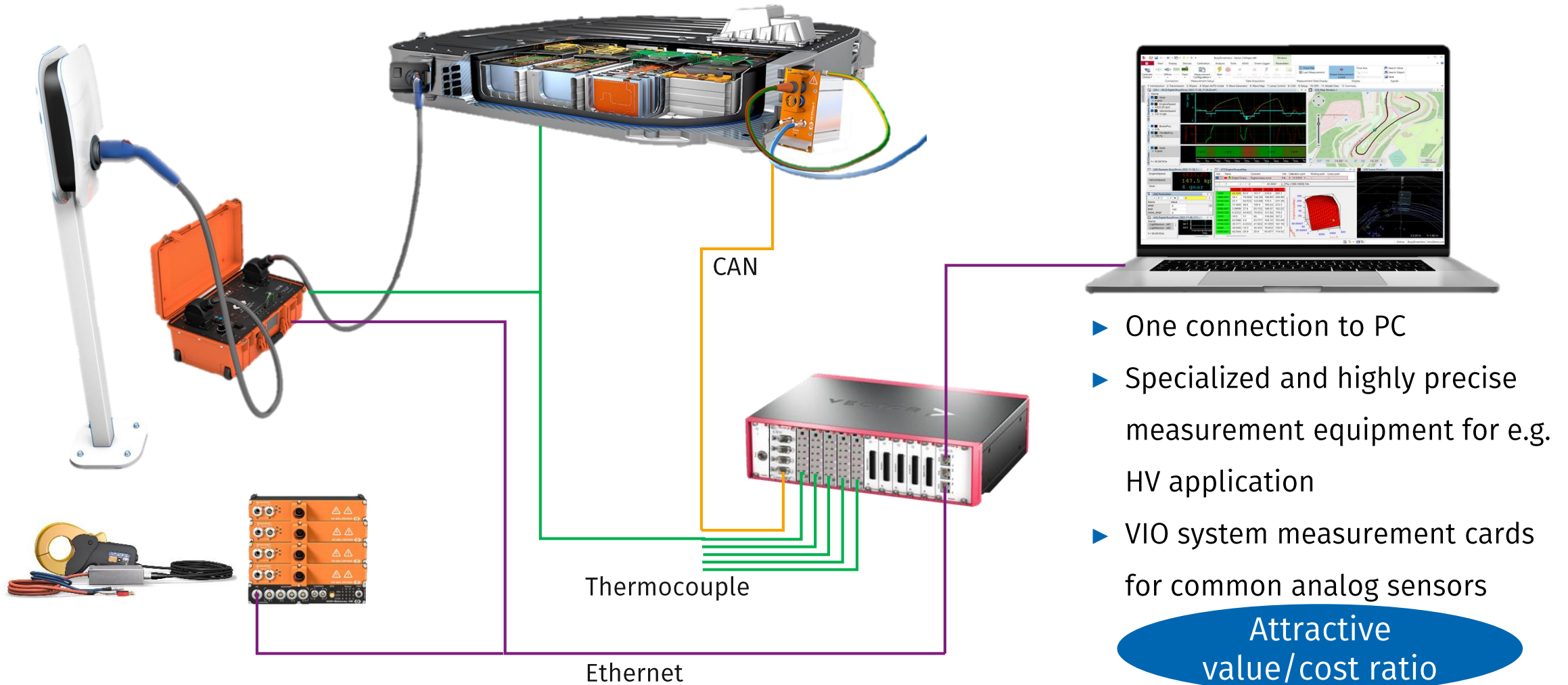


CANape and vMeasure: Measurement Configuration

- ▶ Configure channels:
 - ▶ Signal name
 - ▶ Meas. data rate
 - ▶ Measurement mode, e.g. voltage/current
 - ▶ Measurement range
 - ▶ Filter
 - ▶ ...



VIO Systems + CSM = Your Benefit



Summary

VIO System is a

- ▶ centralized
- ▶ flexible
- ▶ *versatile*
- ▶ *synchronized*
- ▶ easy to extend
- ▶ good value

analog measurement system by Vector



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