



Solution: USB-to-CAN V2 compact

Country: Germany

Year: 2024

Organizations: munichMotorsport, Hochschule München

Sector: motor racing, education

## CAN communication at munichMotorsport: Formula Student team chooses Ixxat USB-to-CAN adapter

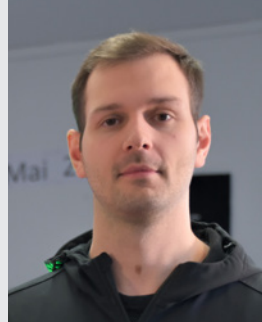
### Background

Data communication plays a key role in motorsport, where precision and technological excellence make the difference between taking the checkered flag or failing to get in the points. When assembling and testing their vehicle electronics based on the CAN fieldbus, the munichMotorsport Formula Student racing team at the HM Hochschule München University of Applied Sciences uses Ixxat USB-to-CAN adapters to read out CAN data signals. One by one, the electronic components are connected via a cable harness to the vehicle control unit (VCU) for testing. From the steering wheel, the gas and brake pedals, to the dashboard, components from a total of four different CAN buses are connected to the VCU and rigorously tested.

### Data communication for safety and performance

Along with many other challenges, the munichMotorsport team faces the task of precisely recording a varied range of complex data for the season's new race car in real time so they can steadily improve its safety and performance. Ultimately, the fastest lap is not the only decisive factor in this engineering design competition. The overall electronics system plays an equally important role, so integrating a reliable, high-performance CAN-based data communication system is essential.

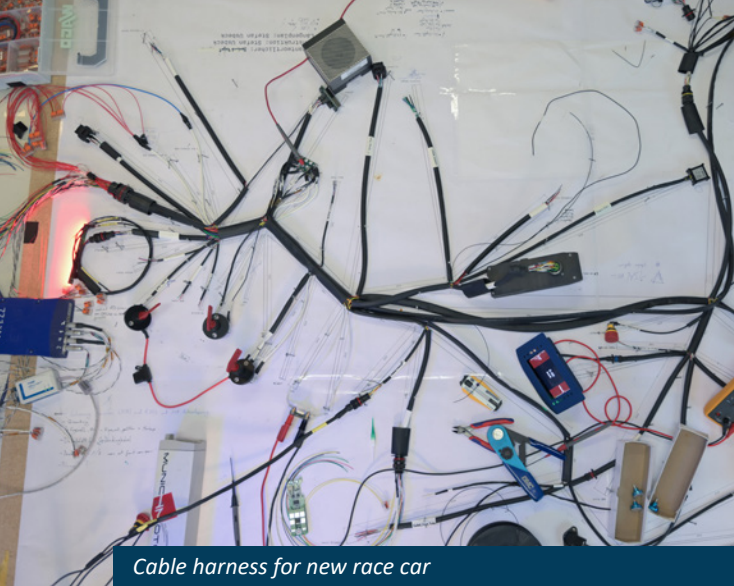
*"Not only does plug-and-play make the compact and rugged desktop housing easy to install, the USB-CAN converter's software also makes it quick and easy to start up."*



Bernhard Riegert  
Electronics team lead at munichMotorsport

### CUSTOMER BENEFITS

- ✓ Easy connection of CAN-based in-vehicle communication system to a PC
- ✓ High data transfer rates for demanding applications
- ✓ High level of galvanic isolation to protect system nodes and the PC
- ✓ Rugged design ideal for use in the field



Cable harness for new race car

“Putting together the cable harness is a crucial step in the race car’s design process,” says Bernhard Riegert, an electrical engineering student who heads the electronics team at municHMotorsport. “That includes routing the CAN cables, the power cables, and the shutdown circuit in the cable harness. All of the analog and digital sensor cables also have to be positioned, and then every connection has to be tested for integrity and functionality.”

## USB-to-CAN adapters in use: testing components on the cable harness

After painstaking assembly of the cable harness comes initial desktop operation of the individual components and extensive CAN communication tests. This is where the Ixxat USB-to-CAN adapters come into play with their key role in recording and analyzing the CAN bus data. They connect the CAN-based fieldbus world (also called in-vehicle communications) with the PC-based world for data analysis and configuration. A fast 32-bit microcontroller in the Ixxat adapter and CAN baud rates between 10 and 1000 kbit/s ensure high data transfer rates, while high galvanic isolation of up to 1000 VDC/1 s ensures that the other system nodes are protected against overvoltage. An ideal data communication environment is established by using special terminating resistors on the individual components and providing a connection to a laboratory power supply.

“Not only does plug-and-play make the compact and rugged desktop housing easy to install, the USB-CAN converter’s software also makes it quick and easy to start up,” Riegert adds. Compatibility with all commonly used operating systems (Windows, Linux, and real-time operating systems) ensures the supplied driver packages (VCI, ECI, or SocketCAN) support extensive configuration and diagnostics functionality for the new race car’s CAN data.

## Technical challenges

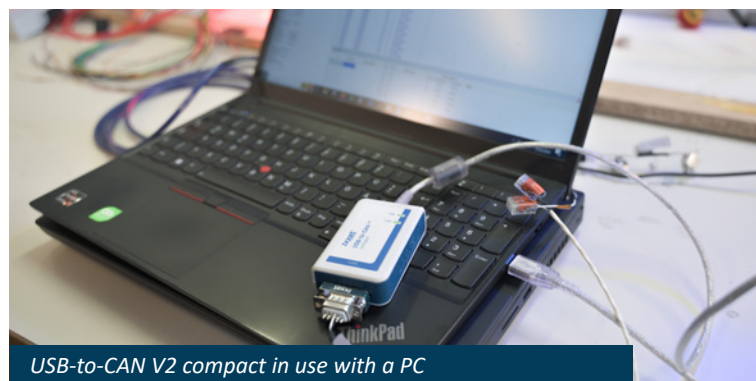
Putting such a complex system to work has its challenges. From bus errors caused by incorrectly set terminating resistors to baud rate conflicts, the team has to solve numerous technical problems to ensure error-free data transmission. For example, they have to pay careful attention to the placement of terminating resistors between the CAN High and CAN Low cables. This resistance must be exactly 60 Ohms, with two 120 Ohm resistors connected in parallel at the first and last devices on the CAN bus. Caution is also called for with the baud rate; it only takes a single device set incorrectly to prevent data from being read out on the entire bus.

## Simple and intuitive adapter handling for easier troubleshooting

“With CAN communication, you have to pay attention to a lot of small details. This work is a lot easier with the rugged Ixxat USB-to-CAN adapters thanks to their practical handling and easy connection and startup. That enables us to build a safe and reliable race car,” Riegert says.

The Ixxat USB-to-CAN adapters provide a robust and flexible solution for motorsport’s data communication challenges. Being able to transfer and analyze complex data structures reliably allows Riegert and his 11-strong electronics team to collect and analyze performance data in real time. The adapters play a key role in the simulation of CAN messages and support the team’s troubleshooting activities.

The municHMotorsport team’s use of the Ixxat USB-to-CAN V2 adapter is an impressive demonstration of how modern technologies assist motorsport from day to day and help it to advance. By overcoming technical challenges and optimizing data communication, the team contributes to technological innovation and paves the way for future wins on the track.



USB-to-CAN V2 compact in use with a PC

For more information, see <https://www.hms-networks.com/usb-to-can> and <https://munichmotorsport.de/>