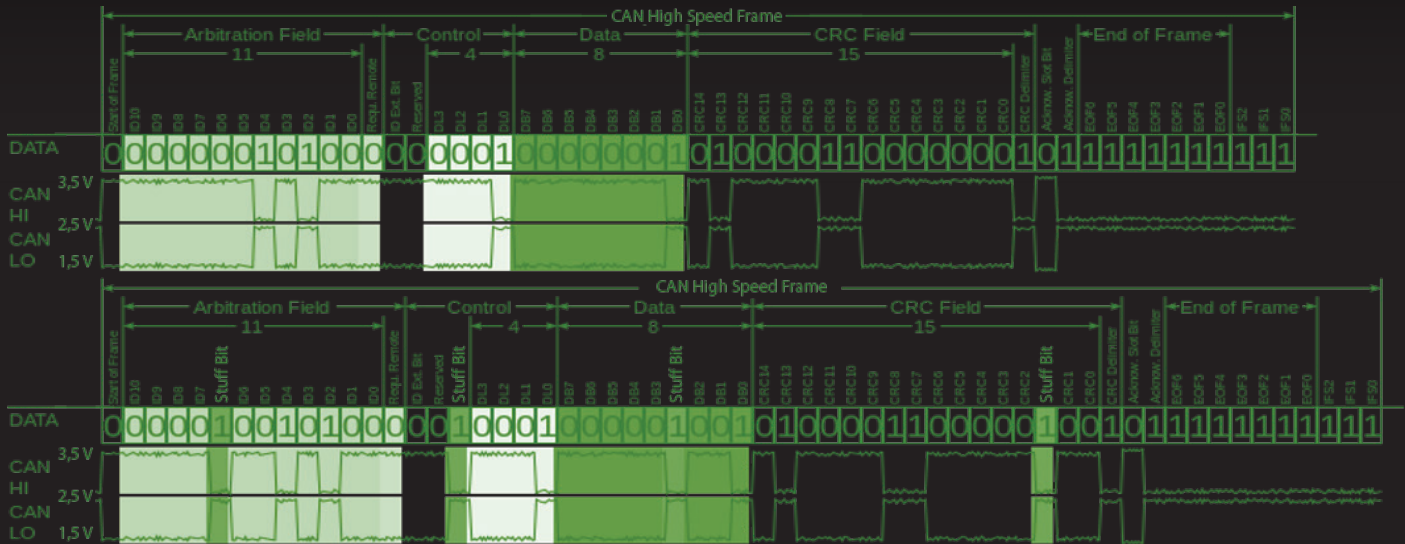


# STAR COOPERATION®

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## CAN

# FL3X Training

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The Controller Area Network (CAN) is an electronic communication defined by the ISO 11898 standard and is designed to replace the wiring harness due to great demand from early automotive vehicles.

Since the performance of the classic CAN bus is no longer sufficient for today's data transmission rate requirements, the advent of second-generation CAN-based communication "CAN Flexible Datarate" (CAN FD) paves the way to increase the transmission data rate up to 8Mbit/s. The increased efficiency is achieved by enlarging the payloads of 8-bytes Classical CAN up to 64 Bytes.

The third generation of CAN-based protocol CAN XL is intended to fill the gap between Classical CAN/CAN FD and Automotive Ethernet technology. It contains extra-large payloads of up to 2048 bytes.

Fundamental concepts of CAN provide more flexibility in terms of broadcast mechanisms, differential voltage bus concepts, resolving the bus conflicts using bit-wise Arbitration, Bit-stuffing in CAN/CAN-FD, data frame formatting, data frame types, nominal Bit Timing with synchronization, elaborating schemes for Error Handling and confinement, etc.

Furthermore, CAN XL provides higher data rates, even more scalability in terms of bandwidth, enabling the tunneling of complete Ethernet Frame (TCP/IP, SOME/IP) in the CAN XL Frame.

CAN XL also allows Service-Oriented Communication, data Frame formats and integration to an Ethernet Network. It introduces a new secure zone-based communication in CAN XL data transmission, known as CANsec. Since CAN and CAN FD are closely related to each other, the content of the presentation covers both protocols.

### AGENDA

- 09:00 – 09:15 Introduction to CAN
- 09:15 – 09:45 CAN Physical layer
- 09:45 – 10:00 Practical part I
- 10:00 – 10:30 Break
- 10:30 – 11:15 CAN Data Transmission
- 11:15 – 11:30 Practical part II
- 11:30 – 13:00 Break
- 13:00 – 13:15 CAN Bit Timing
- 13:15 – 13:45 CAN Error Handling
- 13:45 – 14:00 Practical part III
- 14:00 – 14:30 Break
- 14:30 – 14:45 CAN XL Basics
- 14:45 – 15:15 CAN XL Data Transmission/CAN XL Error Handling
- 15:15 – 15:30 Practical part IV
- 15:30 – 16:00 Results/summary/open questions

# FL3X Training CAN

## CAN TRAINING COVERS BOTH THE THEORETICAL & PRACTICAL PART

- **CAN Overview with respect to Automotive Domain**
- **CAN Physical layer**
  - CAN Bus (CAN High & CAN Low)
  - CAN Bus Logic (Dominant & Recessive)
  - CAN Bus differential voltage
  - CAN Transceiver & CAN Controller
  - CAN Bus Termination
  - CAN Connectors
  - CAN-based Evolution
- **CAN Data Transmission Data link layer**
  - Bitwise Arbitration
  - Standard/Extended Classical CAN/CAN FD Frame Formats
  - CAN Frame types
  - Non-Return to Zero (NRZ) with Bit-Stuffing in CAN/CAN-FD
- **CAN Bit Timing**
  - Bit Time
  - Time Quanta
  - Bit Time Segmentation
  - Edge Phase Error
- **CAN Error Handling**
  - Error Counters (TEC & REC)
  - Error States (Error Active & Error passive & Bus Off)
  - Error Confinement
  - Error detection mechanisms
- **CAN XL Basics**
  - CAN XL Overview with respect to Automotive domain
  - CAN Protocol Milestones
  - CAN XL in OSI reference Model
  - CAN XL core properties
- **CAN XL Data Transmission/CAN XL Error Handling**
  - CAN XL Data Frame Format
  - IP Concept on CAN XL
    - CAN XL integration to an Ethernet network
    - Embedded IP packets into CAN XL Frames
  - CAN XL Security (CANsec)
  - CAN XL Error Handling
    - CAN XL Error Detection mechanisms
    - Error Mechanisms
    - Error Types
    - Format Checks
    - CRC Checks
    - Bit Monitoring

## FACTS/CONDITIONS

	At STAR	At CUSTOMER location	ONLINE
Min. participants	3	6	1
Max. participants	20	20	20
Appointment	by arrangement	by arrangement	by arrangement
Incl. Lunch and drinks	•	-	-
Language	english	english	english
Language documents	english	english	english
Documentation	digital	digital	digital
Certificate	•	•	•
Location	Star Goeppingen	in Germany only	online
Praxis parts	•	•	•

## ORDER INFORMATION

Product	Description	Order number
FL3X Training CAN (@ STAR)	1 day on CAN <b>at STAR ELECTRONICS location</b>	3-00202F01
FL3X Training CAN (@ Customer)	1 day on CAN <b>at customers location</b>	3-00202G01
FL3X Training CAN (Online)	1 day on CAN <b>online</b>	3-00202H01