VC-EVCC

User Manual

Version 1.3.0

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Document Information

History

Author	Date	Version	Remarks
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sng/dim	2021-08-11	1.3.0	Chapter 1.3 Product Compliance: Note added reg. conducted FCC certification tests. Chapter 3: Correction of reference.

Reference Documents

No.	Source	Title	Version
[1]	DIN	DIN 70121:2014-12	2014-12
[2]	DIN	DIN EN 61851-23 – Konduktive Ladesysteme für Elektrofahrzeuge – Teil 23 Gleichstromladestationen für Elektrofahrzeuge (IEC 61851-23:2014)	2014
[3]	DIN	DIN EN 61851-23 Berichtigung 1 – Konduktive Ladesysteme für Elektrofahrzeuge – Teil 23 Gleichstromladestationen für Elektrofahrzeuge (IEC 61851-23:2014/COR1:2016)	2014
[4]	IEC	IEC 61851-1:2010	2010
[5]	ISO	ISO 15118-2:2014(E)	2014
[6]	ISO	ISO 15765-2:2011	2011
[7]	ISO	ISO 14229-1:2013(E)	2013
[8]	VDV	VDV 261 specification	2018
[9]	SAE	SAE J3068 Electric Vehicle Power Transfer System Using a Three-Phase Capable Coupler	2018
[10]	SAE	SAE J1772 Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler	2017

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1 Introduction

This chapter contains relevant information about Product Compliance, Warranty and Safety Instructions. Observe all local and regional laws and regulations as well as the safety regulations mentioned in this document. This Manual is valid for the VC-EVCC and the related product variants (trade names):

> VC-EVCC Series

> VC-EVCC Evaluation

In the following all product variants are referred to as VC-EVCC unless expressly stated otherwise.

1.1 About This Manual

In the tables below you will find the notation and icon conventions used throughout the manual.

Symbol	Utilization
	This symbol provides you with notes and tips that facilitate your work.
	**Danger** Type and source of the hazard Consequences of non-compliance > Measures for avoiding the hazard
	**Warning** Type and source of the hazard Consequences of non-compliance > Measures for avoiding the hazard
	**Caution** Type and source of the hazard Consequences of non-compliance > Measures for avoiding the hazard
	This symbol indicates where further information is available.
	This symbol indicates where examples are available.
	This symbol indicates where step-by-step instructions are available.
	This symbol can be found in text areas where changes of the currently described file are allowed or necessary.

	This symbol indicates that you must not change these files.
	This symbol indicates that multimedia files are available.
	This symbol indicates where introductory information is available.
	This symbol indicates where basic knowledge is available.
	This symbol indicates where expert knowledge is available.
	This symbol indicates changes in the manual.

1.2 Management Standards

Quality Management System

Vector Informatik GmbH fulfills the requirements according to ISO 9001:2015 certification. The ISO standard is a globally recognized standard for quality management systems.

1.3 Product Compliance

This chapter contains relevant information about the product compliance-matters of the ECU categorized via the economic areas.

The device solely complies with the regulations listed in the following sub-chapters in the case that the device is mentioned at the corresponding sub-chapter and if the device´s label also bears the market- or regulation specific mark(s) of the respective chapter.

Note
Restrictions regarding Installation and Usage due to Product Compliance Reasons

For this device only OEM installation is allowed.

Furthermore, the usage of this device is restricted to professional users and experts.

Note

Restrictions due to Product Compliance Reasons

This restriction is solely valid for evaluation-devices “VC-EVCC Evaluation”.

The length of cables connected to the following pins is restricted to a maximal length of 3m:
LED0, LED1, LED2, LED_GND, VCC_SS, SS_GND, DIN, DIN_GND, HS_OUT0, HS_OUT1, HS_OUT2, HS_OUT4 (see Chapter 10.1).

The usage of the fitting wiring harness provided by Vector or a wiring harness with comparable technical properties is strongly recommended.

Note

The CE/ UKCA certification tests were conducted according to the standard EN 61326-1:2013

The standard was applied as follows:

- Emission: Class B*, Group 1**
- Immunity: Controlled Electromagnetic Environment***

* Class B product: Suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

** Group 1 product: Product in which there is intentionally generated and/or used conductively coupled radio-frequency energy which is necessary for the internal functioning of the equipment itself.

*** Immunity test requirements for equipment intended to be used in a controlled electromagnetic environment.

1.3.1 EU: Applied Regulations & Restrictions of Use

CE Conformity (EU Product Conformity) according to Regulation (EC) 765/2008

This section is solely valid for evaluation-devices “VC-EVCC Evaluation”.

For the concretely applied regulations and standards of this scope see “EU Declaration of conformity” of this device.

Due to the compliance with the regulatory requirements mentioned above the device bears the following required CE marking:

Figure 1-1 CE Mark on Product Label

WEEE Conformity according to EU Directive 2012/12/EU

This section is solely valid for evaluation-devices “VC-EVCC Evaluation”.

The device must not be disposed of in the domestic waste in accordance with the Waste Electrical and Electronic Equipment (WEEE) Directive 2012/12/EU.

Bring the device to a collection point for waste electrical and electronic equipment for proper disposal.

Due to the compliance with the regulatory requirements mentioned above the device bears the following required WEEE marking:

Figure 1-2 WEEE Mark on Product Label

1.3.2 UK: Applied Regulations & Restrictions of Use

UKCA Conformity (UK Product Conformity)

This section is solely valid for evaluation-devices “VC-EVCC Evaluation”.

For the concretely applied regulations and standards of this scope see “UK Declaration of conformity” of this device.

Due to the compliance with the regulatory requirements mentioned above the device bears the following required UKCA marking:

Figure 1-3 UKCA Mark on Product Label

1.3.3 USA: Applied Regulations & Restrictions of Use

FCC Conformity - Certification according to FCC Part 15

This section is solely valid for evaluation-devices “VC-EVCC Evaluation”.

This ECU has been certified as Part 15 Class B Digital Device by the Federal Communications Commission of the U.S. Government through following FCC ID: 2AXYRVCEVCC. For Details see “FCC certification” of this device.

Due to the certification mentioned above the device bears the following required FCC ID marking:

Figure 1- 4 FCC ID on Product Label

Information to user regarding changes resp. modifications (FCC § 15.21) and interferences (FCC § 15.19)

Changes or modifications not expressly approved by Party responsible for compliance could void the user’s authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Information

Note
Additional information regarding FCC certificiation (tests)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

1.3.4 Canada: Applied Regulations & Restrictions of Use

ISED Conformity (ICES-003)

This section is solely valid for evaluation-devices “VC-EVCC Evaluation”.

This ECU represents a Category II equipment and therefore is exempt from certification and registration. To represent Vector´s Supplier's Declaration of Conformity (SDoC) with ISED requirements the ISED compliance label is placed on each unit of this device.

Due to the compliance with the regulatory requirements mentioned above the device bears the following required ISED compliance label:

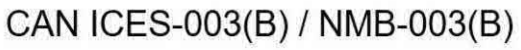


Figure 1-5 ISED Compliance Label on Product Label

1.4 Warranty

We reserve the right to modify the contents of the documentation or the software without notice. Vector disclaims all liabilities for the completeness or correctness of the contents and for damages which may result from the use of this documentation.

1.5 Open-Source Software

No open-source software used.

1.6 Product Designations, Trademarks and Industrial Property Rights

All product designations and/or trademarks mentioned in this manual, which may be protected by third-party property rights, are subject to the regulations of the applicable trademark law and/or the property rights of the respective owner.

1.7 Safety Instructions and Hazard Warnings

Caution
Please take into account the following safety instructions and hazard warnings prior to installation and use of this ECU to avoid personal injuries and damage of property. Keep this documentation always near the ECU and retain this information for future reference.

Caution
This ECU is released as a safety element out of context according to the ISO 26262. The OEM is responsible for the entire vehicle safety concept and must take into account the dedicate Safety Manual [TBD] during the development and commissioning process in order to fulfill the standard and regulatory requirements.

Caution
The ECU may only be operated according to the instructions and descriptions of this manual. The ECU is exclusively designed for use by skilled personnel as its operation may result in serious personal injuries and damage to property. Therefore, only those persons may operate the ECU who have understood the possible effects of the actions which may be caused by the ECU. Users have to be specifically trained in the handling (e.g. calibration) with the ECU, the applied embedded software and the system intended to be influenced. Users must have sufficient experience in using the ECU safely. Only OEM installation is allowed.

Caution
The ECU may control and/or otherwise influence the behavior of control systems and electronic control units. Serious hazards for life, body and property may arise, in particular without limitation, by interventions in safety relevant systems (e.g. by deactivation or otherwise manipulating the engine management, steering, airbag and/or braking system) and/or if the ECU is operated in public areas (public traffic). Therefore, you must always ensure that the ECU is used in a safe manner. This includes inter alia the ability to put the system in which the ECU is used into a safe state at any time (e.g. by “emergency shutdown”), in particular without limitation in the event of errors or hazards. Furthermore, all technical safety and public law directives which are relevant for the system in which the ECU is used must apply. Provided that serious hazards for life, body and property may occur and before the use in public areas the system in which the ECU is used must be tested according to recognized rules of engineering in a non-public area.

Danger
Explosion due to operation of electric devices in potentially explosive atmospheres.
Serious injury or death.
> Observe the applicable regulations and precautionary measures for explosive environments.

Warning
Overload damage due to fault. Serious injury or death.
> Protect the DC power supply circuit with a 15 A circuit breaker (or smaller) in the installation in order to limit the power in case of a fault.

Warning
Hot surfaces or moving parts due to actuated loads. Medium to light injury.
> The actuation and control of loads is the responsibility of the user. Appropriate measures must be taken by the user to prevent injuries which may be caused by the connected loads.

Note
Faults in electronic devices through high-frequency energy

Observe any special regulations and disconnect the power supply of the ECU when its use is not permitted, or you have doubts whether its operation may cause faults or hazards.

Note

Property Damage

- The device must be installed, connected and commissioned by a qualified and trained person.
- Disconnect the device from all connections before handling it.
- Disconnect all independently supplied power circuits.
- The degree of protection IP6K6K, IP6K7 and IP6K9K can only be guaranteed when all connections of the device are fitted with connectors with the same protection degree. Therefore, all information about qualification of the VC-EVCC is only valid for this installation position [see Chapter 8, Figure 8-2].
- The device must only be repaired by the manufacturer.
- Keep substances containing solvents and graffiti dissolver gel away from the type plate.

2 General

The Vector Controller – Electric Vehicle Communication Controller (VC-EVCC) is a generic ECU for 24V environments.

It realizes electrical charging according to DIN SPEC 70121 see [1] and ISO15118 see [5] for power line communication (PLC) with the infrastructure.

The Hardware basis is the VP-EVCC with an integrated flash bootloader. The VC-EVCC includes a modern MICROSAR stack with all relevant application modules to realize electrical charging communication.

Figure 2-1 VC-EVCC

The following parts are included in the delivery:

Part	Description
VC-EVCC	ECU with integrated software
Documentation	Customer receives a Technical Reference as well as a User Manual (this document) and Charging Sequence Diagrams. The full delivery content is described in the Technical Reference
Remaining Bus Simulation	CANoe bus simulation for the VC-EVCC for bus test and evaluation purposes ▶ CAN Database description (dbc) ▶ Diagnostic description File (cdd)

Table 2-1 Delivery Content

3 System Architecture

The VC-EVCC is designed to be integrated into the vehicle with the following system architecture. The VC-EVCC supports either the combined charging system (CCS) combo 1 or combo 2 inlets according to the charging standards [10] and [4]. The supported charging standard is configurable via software.

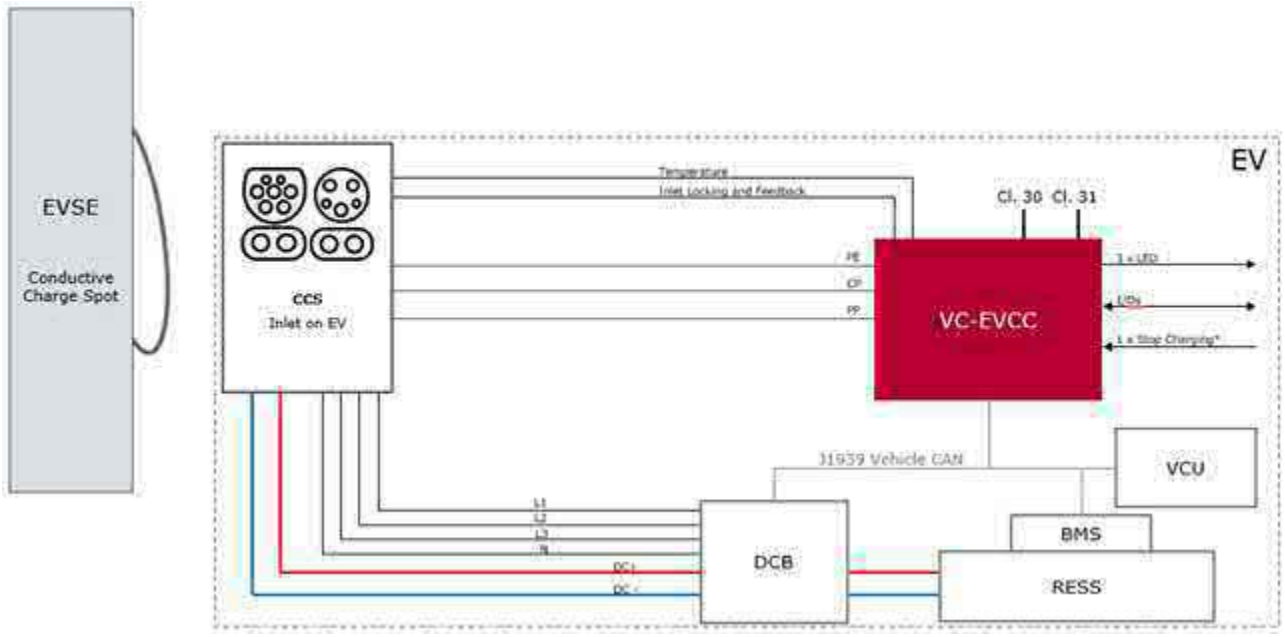


Figure 3-1 System Overview

3.1 Supported Peripherals

The supported peripherals for inlet charging depend on the charging standard:

- **Charging standard CCS-1 (Combo 1 Inlet):**
  - Phoenix CCS Type 1 Inlet EV-T1GBIE12-1AC series (inlet w. lock)
  - Phoenix CHARX T1HBI12 series (inlet w. lock) **with restrictions (see Caution note)**
- **Charging standard CCS-2 (Combo 2 Inlet):**
  - Amphenol HVCO-CF6-ATR8-SF series (inlet) & C-NEVDC12V_ELOCK (lock)
  - Phoenix CCS Type 2 Inlet EV-T2GBIE12-1AC series (inlet w. lock)
  - Phoenix CCS Type 2 Inlet EV-T2GBIE12-3AC series (inlet w. lock)
  - Phoenix CHARX T2HBI12 series (inlet w. lock) **with restrictions (see Caution note)**
  - REMA REV-2C series (inlet) & REMA CCS Actuator (lock)

Caution
The Phoenix Inlets CHARX T1HBI12 and CHARX T2HBI12 (Generation 4) use a different PT1000 characteristic curve than implemented within the VC-EVCC. As a result, the VC-EVCC will not stop charging at the critical temperature of 90°C.

Instead, the vehicle must monitor the resistance values of PTC1 and PTC2 which are transmitted on the J1939 vehicle CAN. The vehicle is responsible to stop charging once a temperature of 90°C is reached.

For further details about the PT1000 characteristic curves and the respective resistance thresholds of the Phoenix Inlets (Generation 4) please refer to the Phoenix installation manual.

In general, a vehicle inlet must have the following characteristics in order to be compatible with the VC-EVCC:

- 12V actuator for locking/unlocking mechanism
- Position feedback evaluation according to chapter “Plug Locking”
- Temperature sensors for AC charging (PTC) and DC charging (PT1000)

The VC-EVCC provides UDS configurations for certain inlet characteristics like resistors or temperature sensors. Details are described in the chapter “UDS communication”.

Note
Inlet manufacturers are continuously developing inlets and adapting them to the new requirements. For this reason, the range of available inlets is also changing. Once other inlets are used than mentioned above, please contact the Vector support in order to check the compatibility with the VC-EVCC.

4 ECU

This chapter contains an overview about the VC-EVCC. The electrical and mechanical characteristics of the VC-EVCC are part of this User Manual.

4.1 ECU Overview

The following diagram and tables give an abstract overview of the interfaces of the hardware.

Note
There are many different configuration options for the hardware of the VC-EVCC. The following figure shows the configuration of the VC-EVCC.

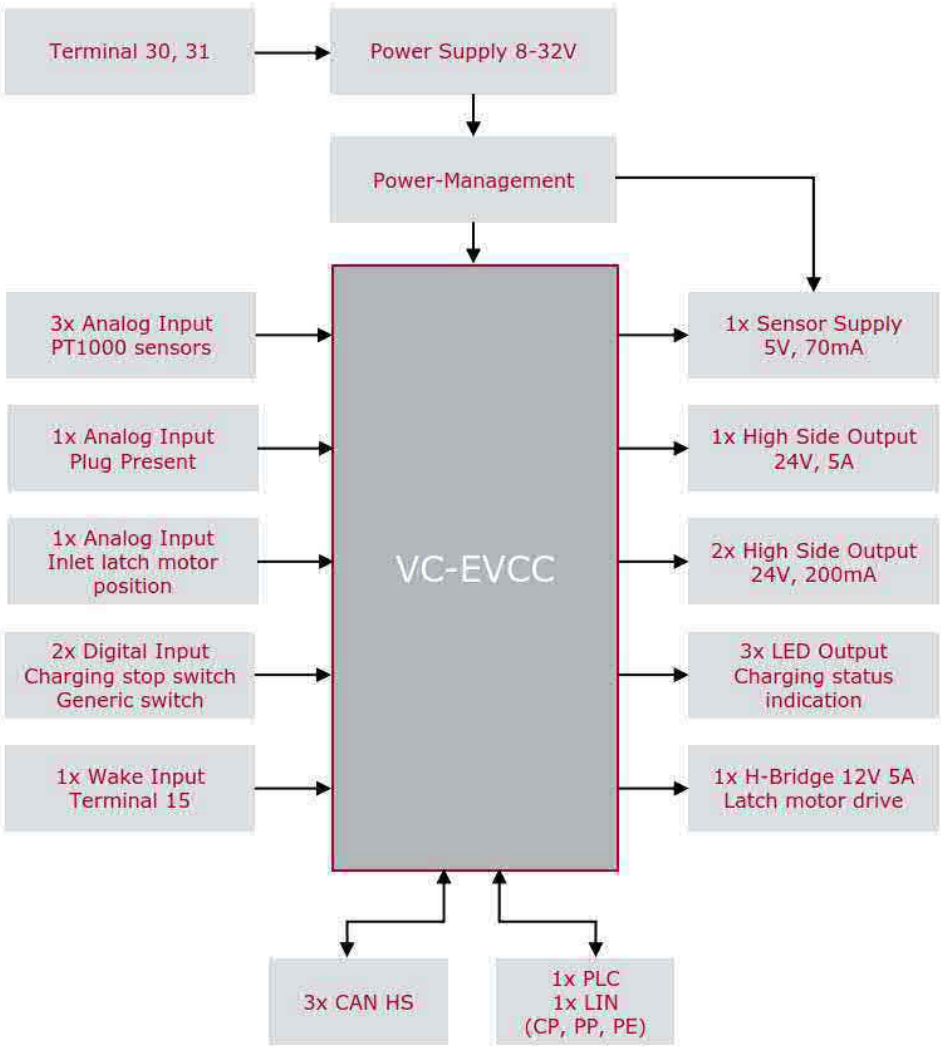


Figure 4-1 VC-EVCC Interfaces

4.2 Key ECU Characteristics

Parameter	Description
CPU	SPC564B74L7, 120MHz
Memory	3,0 MB Code-Flash, 4x16 kB Data-Flash, 192 kB RAM
Voltage range	8V … 32V (ISO 16750, Code E)
Overvoltage 2 min	48V
Connector	Molex CMC36 Hybrid Sealed (36 Pins)
Communication	3x CAN 2.0B (incl. shielding) 1x PLC – Power Line Communication based on IEC61851, ISO 15118 and DIN 70121 with PP, PE and CP
I/O	Extensive Inputs and Outputs typically needed for in vehicle powerline charging systems
Temperature Range	-35°C … +85°C (ISO16750, Code H)
Typical Current Consumption without loads	150mA
Quiescent Current	203µA
Maximum Current Draw	12A
Recommended fuse (based on hardware tests)	15A
Weight	560 g
IP protection	IP6K6K / IP6K7 / IP6K9K (not valid for unsealed housing)
Functional Safety	Safety targets according to ASIL B

Table 4-1 VC-EVCC Key Characteristics

4.3 ECU Interface Characteristics

The following table gives an overview of the interfaces and functional blocks of the VC-EVCC.

Count	FBB Name	Description / Configuration
3	High-speed CAN	CAN Interfaces > Termination not populated > 100nF capacitive ground coupling on CAN0 shield and CAN2 shield > Direct connected ground coupling on CAN1 shield
1	PLC	High Level Powerline Communication
1	Control Pilot	Low Level Powerline Communication
1	Plug Present	Proximity Pin logic

3	Analog Input PT1000	PT1000 temperature sensor input
3	20mA LED Output	Constant current output for LEDs > PWM dimming > Static digital
1	Latch Position Input	Analog input to read a resistor value coded latch or switch
1	Digital Input 0…UBat	Wake-up capable input
3	200mA High-Side Output	Low power 24V output > PWM > Static digital
1	Wake-up Input	Terminal 15 wake-up line. > Can only be used in conjunction with CAN0
1	5A High-Side Output	Medium power 24V output > Freewheeling diode > Static digital > PWM
1	5A H-Bridge	12V H-Bridge for motor applications > Static digital
1	Real Time Clock	Internal Real Time Clock for timer and calendar applications
1	Core	> Microcontroller: SPC564B74L7C9EC > Watchdog: Window Watchdog > Supply: 8 … 32VDC

Table 4-2 Interfaces and Functional Blocks

5 Detailed Functional Description

5.1 J1939 CAN

Signal	Description
WakeupRsn_VCVCCU	The wakeup reason of the VC-EVCC

Table 5-1 J1939 CAN Signals

Functionality

CAN channel CAN1 is the J1939 vehicle CAN. The baud rate is set to 250kBit/s but can be configured through the diagnostic channel. At each reboot, the VC-EVCC checks the stored parameter for the configuration and adjusts itself automatically. The configuration needs to be done only once.

It is wakeup capable and an BMS network management is implemented.

The wakeup reason is set in the signal WakeupRsn_VCVCCU.

Wake-up Reason	Description
NETWORK	wakeup caused by the J1939 CAN
SWITCH	wakeup caused by a Digital Input
PLUG_PRESENT	wakeup caused by plug present detection
CONTROL_PILOT	wakeup caused by a control pilot detection
RTC	wakeup caused by the real-time clock
CLAMP15	Wakeup caused by the Terminal15 wakeup input

Table 5-2 Wakeup Reasons

If more than one wake-up reason is set, the signaling of the wake-up reason is done with the following priority order (from high to low):

- NETWORK
- CLAMP15
- CONTROL_PILOT
- PLUG_PRESENT
- RTC
- SWITCH

A charging or diagnostic request on CAN0 (Diagnostic CAN) will activate the J1939 CAN communication.

Awake Reason:

- Network startup time is not expired.
- Diagnostic communication active
- Terminal15 signal input is active

- Communication via vehicle coupler (Control Pilot State B2)

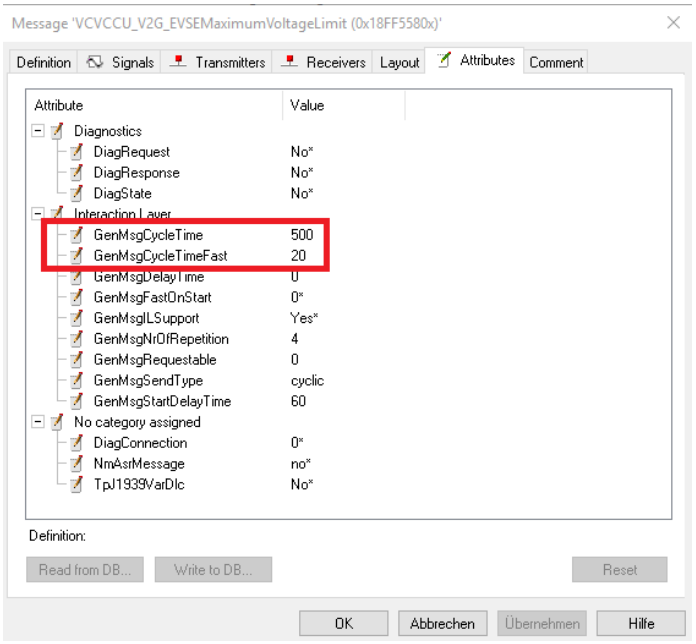
Caution
The VC-EVCC is intended to be used with network management. Therefore, the CAN message “NM_CGW” must be sent by the vehicle in order to ensure full functionality. The recommend cycle time is 100 ms. The value of the included signal “WakeupRsn_CGW” is not relevant and can be determined by the user.

Note
Connecting clamp 30 causes a wakeup of the VC-EVCC. After startup the VC-EVCC stays always awake for 60 seconds.

5.1.1 CAN Message Cycle Times and Bus Load

The database (*.dbc-file) of the J1939 CAN includes detailed information about all messages and signals. The message cycle times are included in the tab “Attributes”. In general, there are two different message cycle times “GenMsgCycleTime” and “GenMsgCycleTimeFast”.

- GenMsgCycleTime contains the message cycle time which is used for normal operation
- GenMsgCycleTimeFast contains a decreased message cycle time for certain CAN messages and is only used during an active charging event. The message cycle time switches from GenMsgCycleTime to GenMsgCycleTimeFast once a signal within the corresponding CAN message changes its value.



In order to reduce the bus load, the VC-EVCC provides configurable message cycle times for certain CAN messages. CAN message cycle times can be increased or set to “0ms” to

stop sending certain CAN messages. Please refer to the chapter “UDS communication” for more information about configurable message cycle times.

5.1.2 End-to-End Protection of CAN Messages

The VC-EVCC uses the MICROSAR Safe End-to-End (E2E) for protection of the CAN messages VCVCCU_ChargeFromVehicle and VCVCCU_ChargeToVehicle. The E2E Profile 1 is used to encode and decode the exchanged data. This method comprises a sequence counter and a Cyclic Redundancy Checksum (CRC) to protect for data consistency, reliability and validity.

The E2E Profile 1 uses the following polynomial of CRC-8-SAE J1850 which protects against corruption of data ensuring its validity for use.

- 0x1D ($x^8 + x^4 + x^3 + x^2 + 1$)

5.1.2.1 VCVCCU_ChargeFromVehicle

The CAN message VCVCCU_ChargeFromVehicle contains the following signals which are used for E2E protection.

- E2E_Cnt_ChargeFromVehicle (Counter): This signal is used to ensure the data is received periodically.

Caution
The vehicle must ensure that the value of E2E_Cnt_ChargeFromVehicle is incremented for every message cycle. The incrementation shall start from value 0x0. Once the value 0x0E is reached the vehicle shall reset the value to 0x0 and start to increment the value again.

The VC-EVCC will raise a DTC if the current counter value deviates from the previously received counter value by a value of 3 or more or if the counter value is unchanged for more than three correctly received messages.

- E2E_CRC_ChargeFromVehicle: This signal is used to ensure the data validity.

The VC-EVCC performs the following calculation to determine the correctness of the CRC received from the signal E2E_CRC_ChargeFromVehicle.

- Calculated CRC = CRC8 over Data ID (0xFF21) and the seven bytes of the CAN message (Byte 0 to Byte 6) including the empty area (set to 0xFF) but excluding the CRC byte (Byte 7) itself.
- E2E Profile 1 requires a XOR-operation of the calculated CRC with value 0xFF. The result is the final CRC value which is added to the CAN message.

Note
For detailed information about E2E Profile 1 and the respective CRC calculation please refer to the specifications “AUTOSAR_SWS_E2ELibrary” and “AUTOSAR_SWS_CRCLibrary” of AUTOSAR release 4.

5.1.2.2 VCVCCU_ChargeToVehicle

The CAN message VCVCCU_ChargeToVehicle contains the following signals which are used for E2E protection.

- E2E_Cnt_ChargeToVehicle (Counter): This signal is used to ensure the data is received periodically. The VC-EVCC increments the value of this signal for every message cycle until it reaches 0x0E after which it is reset to 0x0. Then incrementing will be started again.
- E2E_CRC_ChargeToVehicle: This signal is used to ensure the data validity.
- E2E_State_ChargeFromVehicle: This signal shows the result of the E2E validation of the CAN message VCVCCU_ChargeFromVehicle.

The VC-EVCC calculates the signal value of E2E_CRC_ChargeToVehicle for the CAN message VCVCCU_ChargeToVehicle according to E2E Profile 1.

- E2E_CRC_ChargeToVehicle = CRC8 over Data ID (0xFF17) and the seven bytes of the CAN message (Byte 0 to Byte 6) including the empty area (set to 0xFF) but excluding the CRC byte (Byte 7) itself.

5.1.2.3 Fault Memory

The VC-EVCC provides an error detection for E2E protection. Therefore, the following diagnostic trouble code is used to indicate a fault related to the E2E protection.

- VCVCCU_ChargeFromVehicle E2E Fault (DTC 0x20E0EA)

5.2 Diagnostic CAN

Signal	Description
DiagnosticCAN_Wakeup	The wakeup state of the Diagnostic CAN
DiagnosticCAN_BusOff	The bus off state of the Diagnostic CAN
DiagnosticCAN_WakeupRsn	The wakeup reason of the Diagnostic CAN
DiagnosticCAN_State	The state of the Diagnostic CAN

Table 5-3 Diagnostic CAN Internal Signals

Functionality

CAN channel CAN0 is a diagnostic related CAN supporting the UDS protocol. The baud rate is set to 500kBaud. The diagnostic CAN channel supports wake-up of the ECU (DiagnosticCAN_Wakeup) and an AUTOSAR network management is implemented.

5.2.1 UDS communication

UDS over ISO TP diagnostic communication with the following CAN identifiers is implemented:

- 0x610: physical diagnostic request
- 0x614: functional diagnostic request
- 0x612: diagnostic response

The supported Services and details can be found in the *.cdd file.

Caution
UDS communication must be applied on diagnostic CAN.

5.2.1.1 Overview about ECU Parameters

The following list provides an overview about all configurable ECU parameters and the respective diagnostic identifiers of the VC-EVCC.

J1939 CAN baud rate

- DID FD 00 – Configuration J1939 CAN baud rate

HSOUT0 Wakeup

- DID FD 03 – Configuration HSOUT0 Wakeup

High Side Output diagnostic mode

- DID FD 25 – Configuration HSOUT diagnostic mode

CAN message cycle times

- DID FD 04 – Configuration PTC0 message
- DID FD 05 – Configuration PTC1 message

- DID FD 06 – Configuration PTC2 message
- DID FD 07 – Configuration InletStatus message
- DID FD 08 – Configuration ControlPilotStatus message
- DID FD 09 – Configuration InternalVoltageStatus message
- DID FD 0A – Configuration InternalVoltageRawValues message
- DID FD 0B – Configuration InletStatus2 message

StopCharge CAN signal

- DID FD 13 – Configuration StopCharge CAN Signal Activation

Charging arbitration

- DID FD 0F – Configuration Primary J1939 Source Address
- DID FD 10 – Configuration Secondary J1939 Source Address
- DID FD 14 – Configuration Charge Node Selection Activation

Transport Layer Security (TLS)

- DID FD 0D – Configuration TLS Certificate – V2G
- DID FD 12 – Configuration TLS Certificate – VAS
- DID FD 0C – Configuration TLS Activation

Value Added Services (VAS)

- DID FD 11 – Configuration Value Added Services

Plug and Charge (PnC)

- DID FD 27 – Configuration OEM Provisioning Certificate
- DID FD 28 – Configuration OEM Provisioning Certificate Private Key
- DID FD 29 – Configuration OEM Provisioning Certificate and Private Key
- DID FD 2A – Configuration PnC Contract Certificate
- DID FD 2B – Configuration PnC Contract Certificate Private Key
- DID FD 2C – Configuration PnC Contract Certificate and Private Key
- DID FD 2D – Configuration PnC Sub Certificate
- DID FD 2F – Configuration PnC Root Certificate
- DID FD 26 – Configuration PnC Activation

Charging Schedules

- DID FD 37 – Configuration Charging Schedules Activation

Inlet type and temperature sensors

- DID FD 20 – Configuration Inlet Type
- DID FD 21 – Configuration PTC Activation

AC charging via LIN (SAE J3068)

- DID FD 22 – Configuration LIN charging (SAE J3068) Activation

Security Key Constant

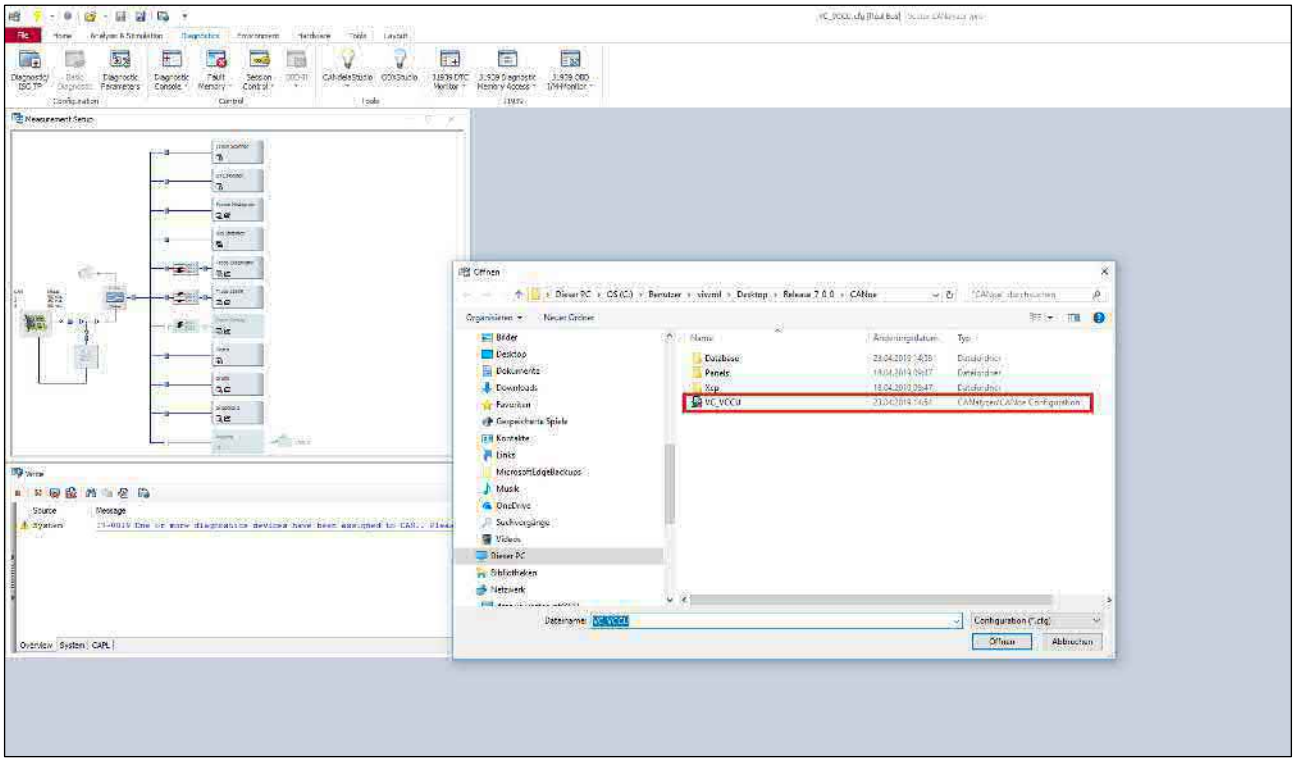
- DID FD 0E – Configuration Security Key Constant

5.2.1.2 Configuration of ECU parameters

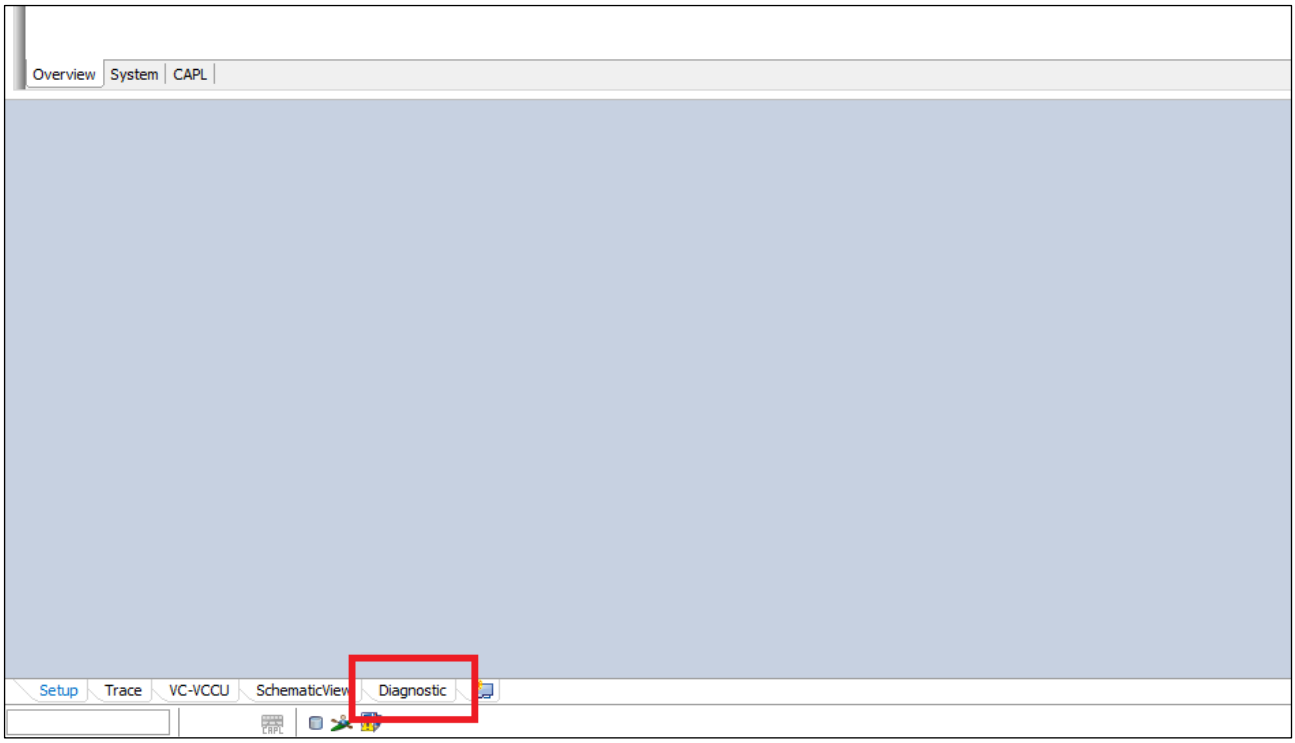
The configuration of ECU parameters can be executed with the Vector tools CANoe or CANalyzer. Alternatively, the configuration can be executed manually. The configuration of ECU parameters with CANoe/CANalyzer is handled within the Diagnostic Console.

The following steps lead to the Diagnostic Console within CANoe/CANalyzer.

1. Start CANoe/CANalyzer and open the delivered CANoe/CANalyzer configuration “VC-EVCC”.



2. Click on the desktop “Diagnostic”. The desktop “Diagnostic” contains the window “VCEVCC Diagnostic Console”. Please note that not all versions of CANoe/CANalyzer include the Diagnostic Console.



The detailed description of the configuration of individual parameters is described in the following chapters. Please note that the measurement must be started to execute configuration of ECU parameters.

5.2.1.2.1 Configuration of CAN1 – J1939 CAN Baud Rate

It is possible to configure the baud rate of the VC-EVCC for the J1939 vehicle CAN.

By using the diagnostic service “Read Data By Identifier” (0x22) – DID 0xFD00 it is possible to read the current configured J1939 CAN baud rate.

By using the diagnostic service “Write Data By Identifier” (0x2E) – DID 0xFD00 it is possible to write the J1939 CAN baud rate.

Note
An update of the parameter requires a reboot of the VC-EVCC to be applicable.
The diagnostic service “Write Data By Identifier” is only available in the application extended session.

The service structure is defined as 1 byte, whereas the upper 6 bits are set to 0.

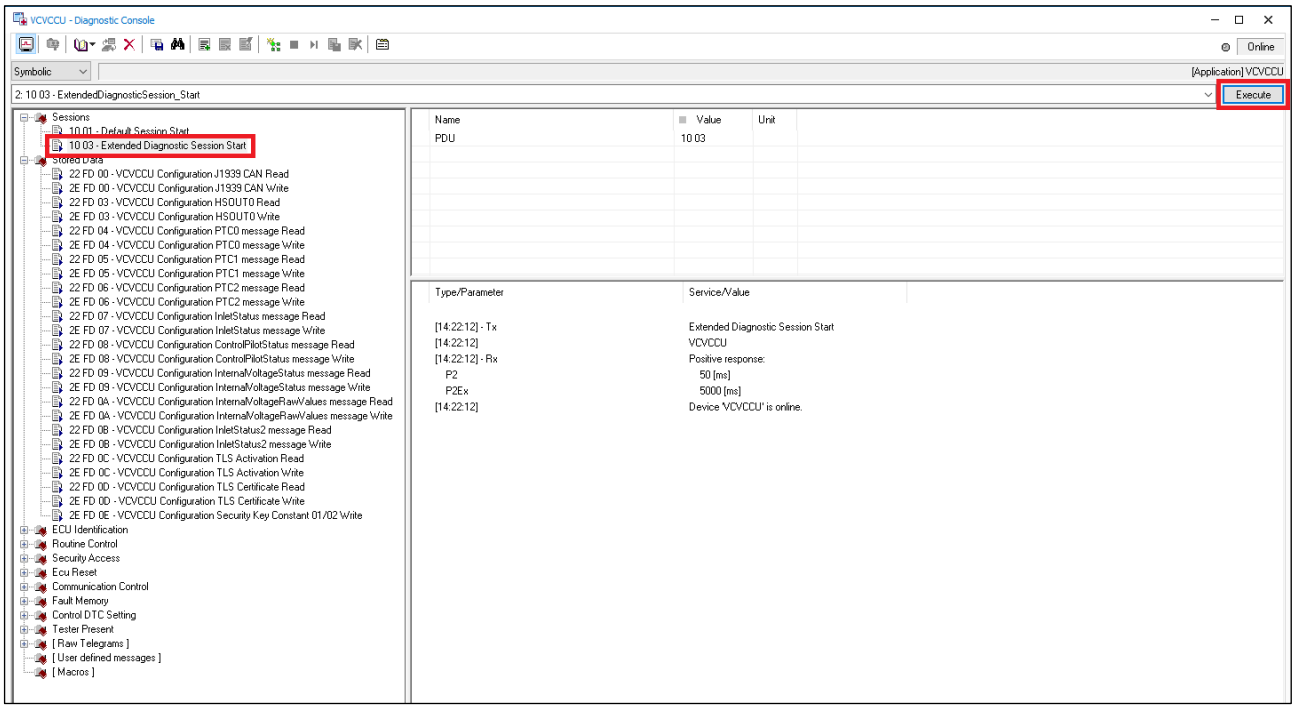
Value	Description
0x00	250 kBaud is configured (default)
0x01	500 kBaud is configured
0x02	1 MBaud is configured

Table 5-4 CAN1 J1939 Baud Rate Configuration on UDS Channel

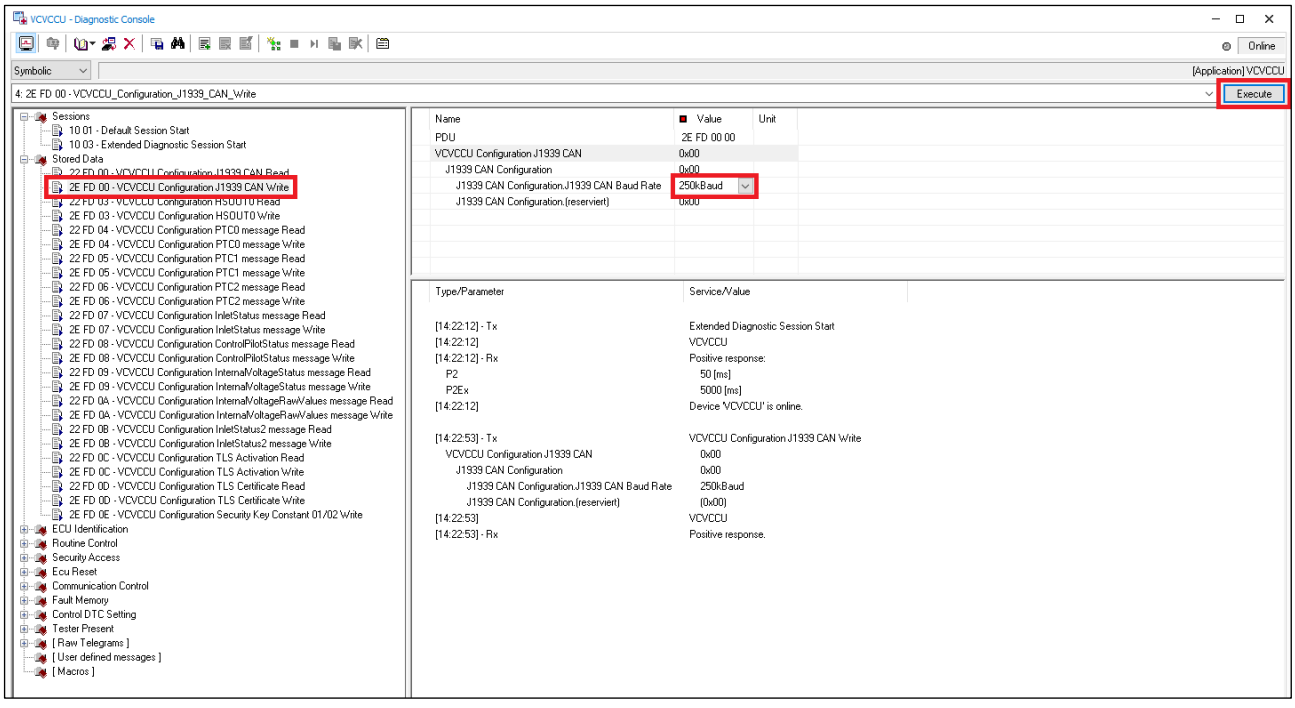
Configuration with CANoe/CANalyzer

The configuration of the J1939 CAN Baud rate can be executed with CANoe/CANalyzer according to the following description.

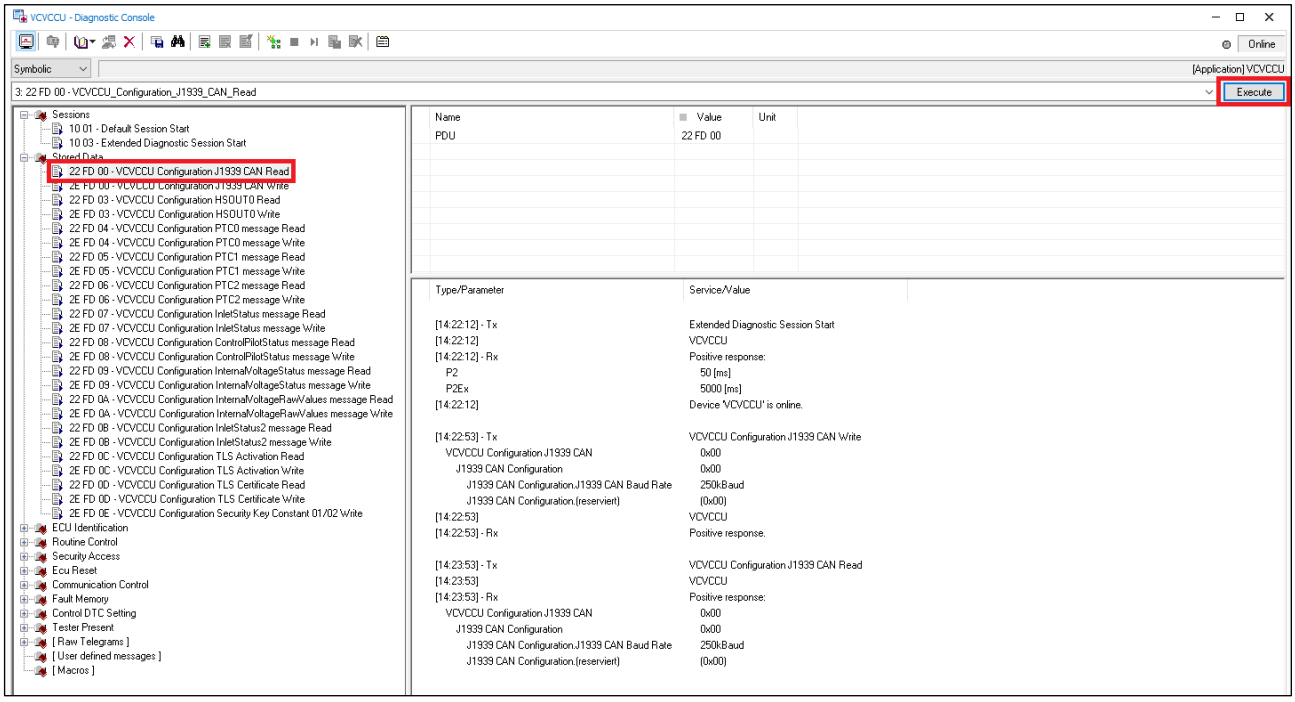
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 00 – VCVCCU Configuration J1939 CAN Write”. Please choose the requested J1939 CAN baud rate and click on the button “Execute”. Please note that the response must be positive.



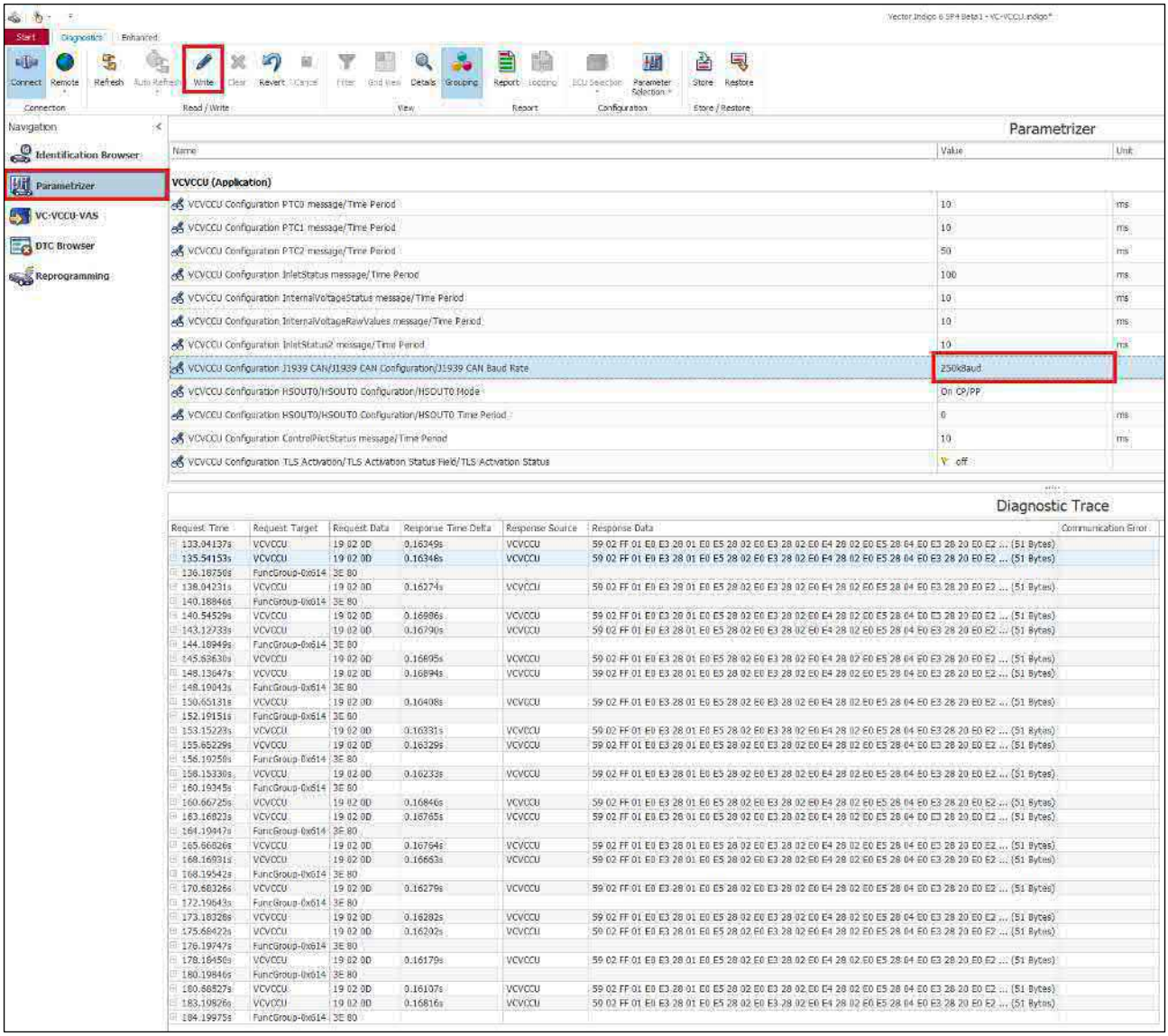
3. By executing the command “22 FD 00 – VCVCCU Configuration J1939 CAN Read” the current configuration of the baud rate can be verified.



Configuration with Indigo

The configuration of the J1939 CAN Baud rate can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the field Value of the VC-EVCC application “VCVCCU Configuration J1939 CAN/J1939 CAN Configuration/J1939 CAN Baud Rate”. Select the requested Baud rate and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session, e.g. every second. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Baud Rate:
XX:
- 0x00 --> 250kBaud
- 0x01 --> 500kBaud
- 0x02 --> 1MBaud

Request: 04 2E FD 00 XX FF FF FF
Response: 03 6E FD 00 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present configuration of the baud rate, the following communication has to be executed.

4. Read Baud Rate configuration:
Request: 03 22 FD 00 FF FF FF FF
Response: 04 62 FD 00 XX FF FF FF

5.2.1.2.2 Configuration of HSOUT0

The VC-EVCC gives the possibility to enable an output at startup to wake-up other ECUs. The behavior can be configured.

By using the diagnostic service “Read Data By Identifier” (0x22) – DID 0xFD03 it is possible to read the current configuration of the HSOUT0.

By using the diagnostic service “Write Data By Identifier” (0x2E) – DID 0xFD03 it is possible to write the configuration of the HSOUT0.

Note
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

The service structure is defined as 1 byte.

Value	Description
0x00	HSOUT0 isn’t enabled at startup (default)
0x01 (bin: nn nn nn 01)	HSOUT0 is enabled for a specific time at startup. > The lower two bits of the data byte are set to 01 > The upper 6 bits leading the data are set to enable the time: Value * 100ms A time between 0ms and 6300 ms is configurable
0x02	HSOUT0 is enabled at startup and isn’t disabled
0x03	HSOUT0 is enabled with respect to CP and PP

Table 5-5 HSOUT0 Configuration on UDS Channel

If value 0x03 is configured the HSOUT0 will be enabled with respect to CP and PP according to the following table:

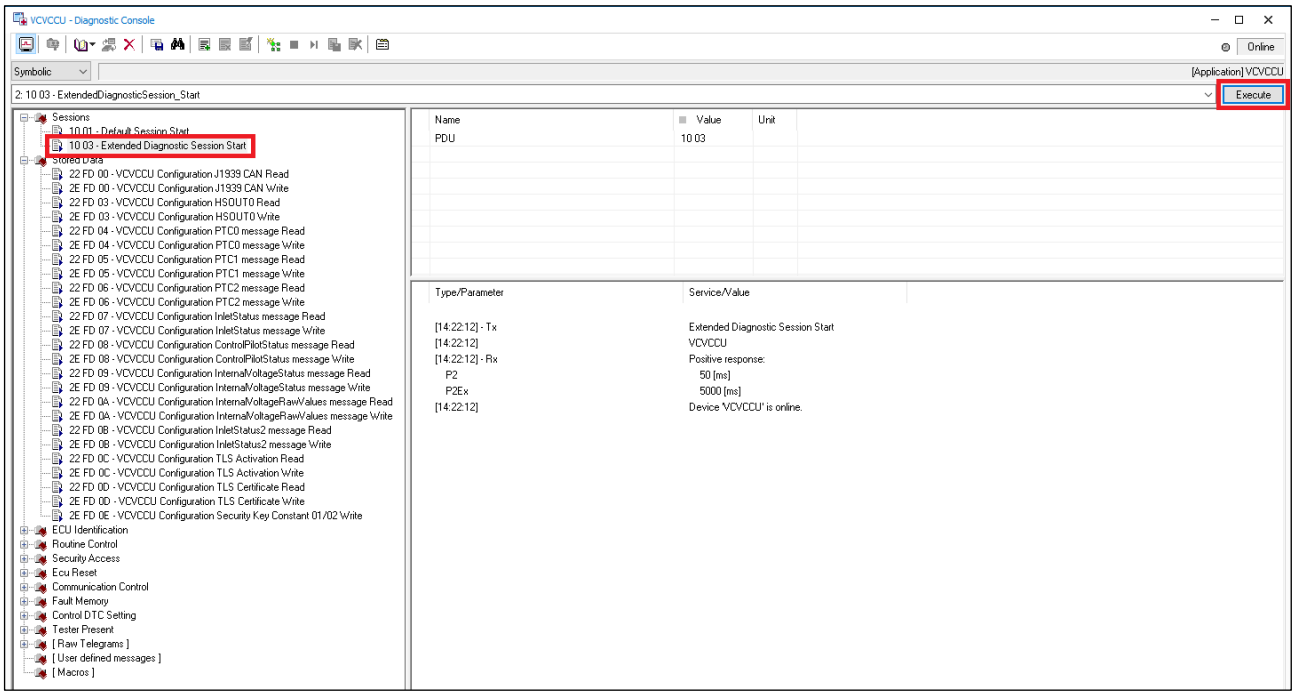
Signal Source	Value	HSOUT0
VCVCCU_ControlPilot_DutyCycle VCVCCU_PlugPresent_Status	SNA && Not_connected	Not_pressed
VCVCCU_ControlPilot_DutyCycle VCVCCU_PlugPresent_Status	SNA && Connected || Error || SNA	Pressed
VCVCCU_ControlPilot_DutyCycle VCVCCU_PlugPresent_Status	1% - 99% || Error && Not_connected	Pressed
VCVCCU_ControlPilot_DutyCycle VCVCCU_PlugPresent_Status	1% - 99% || Error && Connected || Error || SNA	Pressed

Table 5-6 HSOUT on CP/PP Configuration

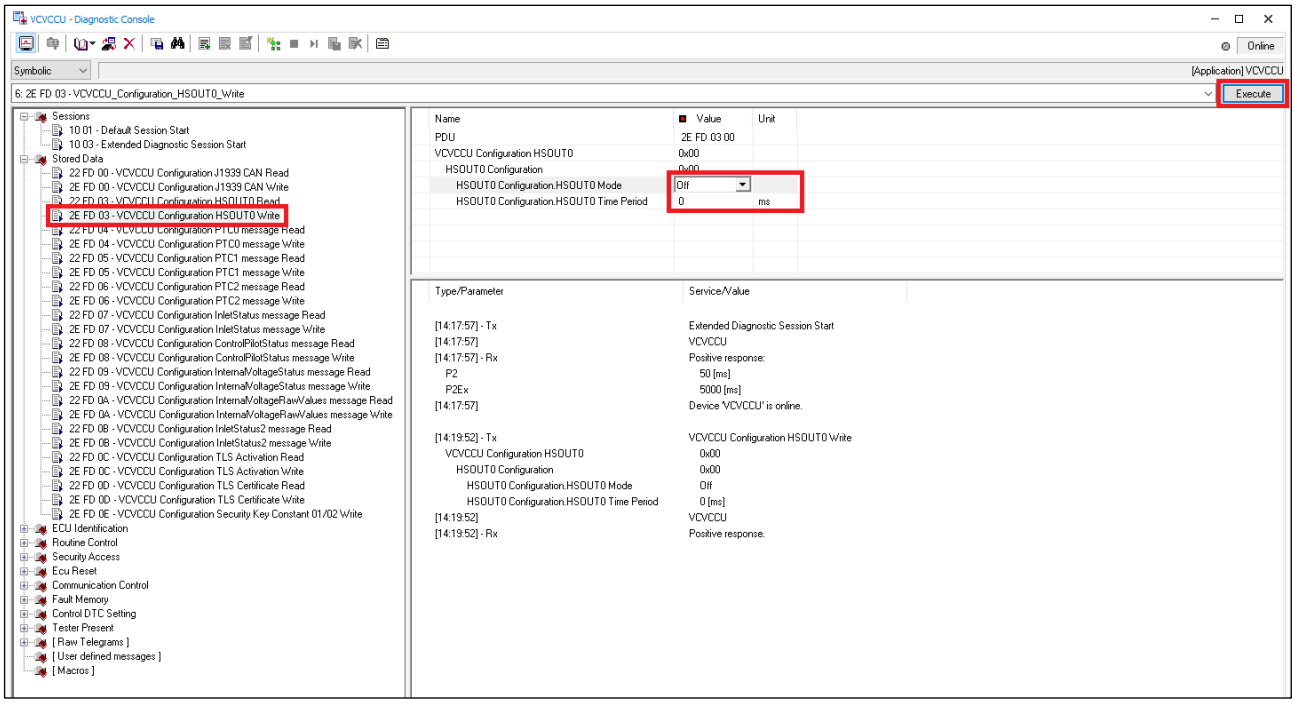
Configuration with CANoe/CANalyzer

The configuration of the HSOUT0 can be executed with CANoe/CANalyzer according to the following description.

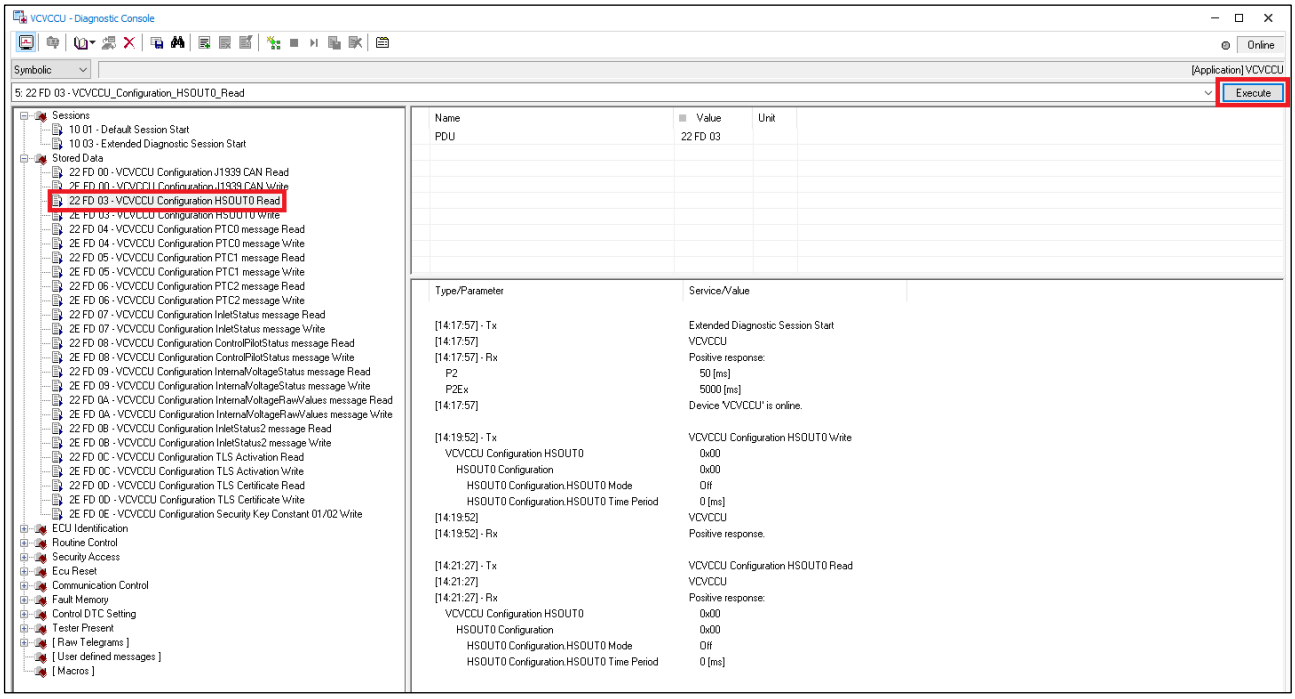
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 03 – VCVCCU Configuration HSOUT0 Write”. Please choose the requested mode as well as the requested time period (only possible in mode “Limited on”) and click on the button “Execute”. Please note that the response must be positive.



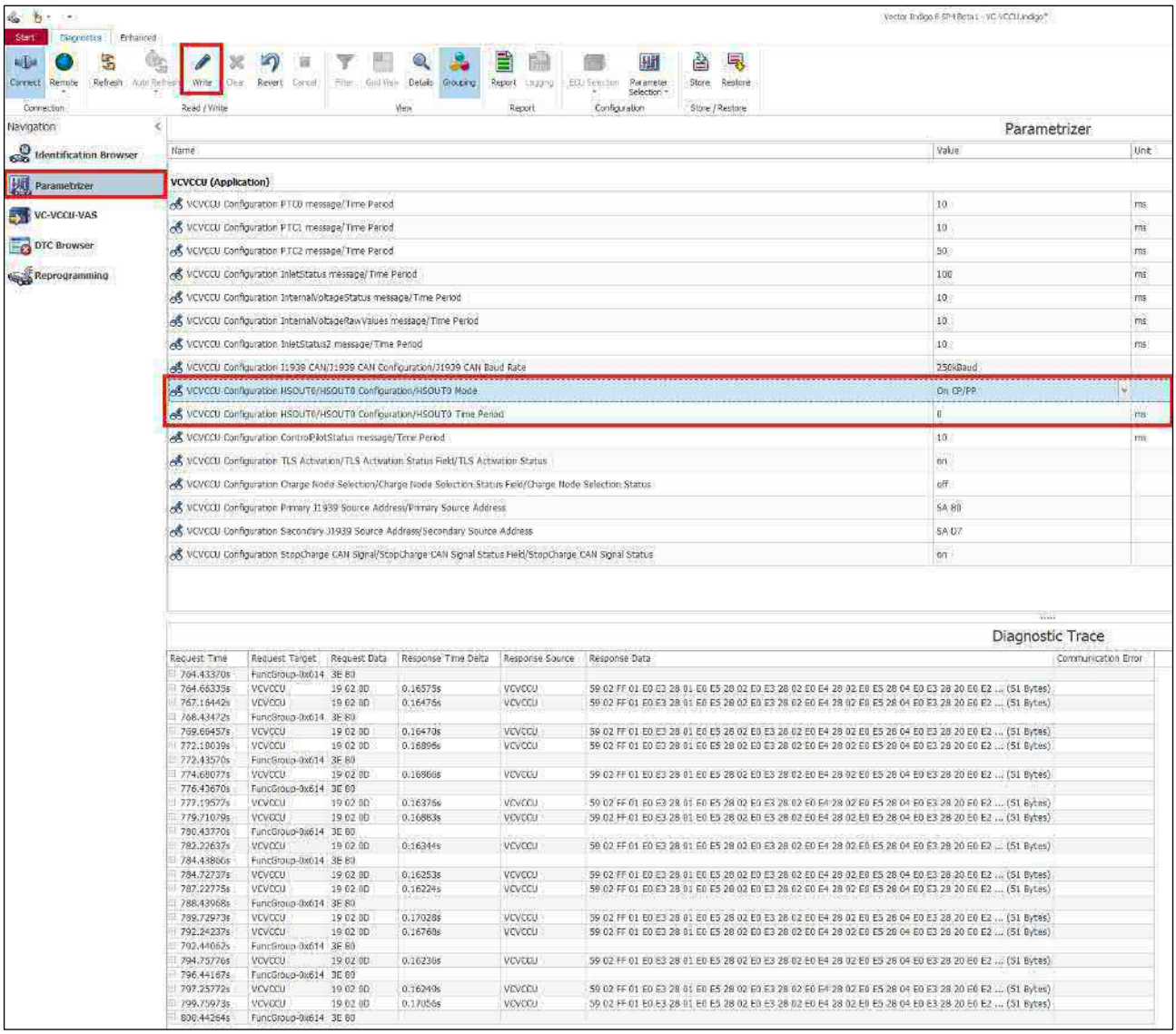
3. By executing the command “22 FD 03 – VCVCCU Configuration HSOUT0 Read” the current configuration of the HSOUT0 can be verified.



Configuration with Indigo

The configuration of the HSOUT0 can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration HSOUT0/HSOUT0 Configuration/HSOUT0 Mode”. Select the requested HSOUT0 configuration and click on the button “Write” to execute the configuration. If configuration is set to “Limited on” the time period can be adjusted by selecting “VCVCCU Configuration HSOUT0/HSOUT0 Configuration/HSOUT0 Time Period”.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session, e.g. every second. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. HSOUT0:
XX:
- 0x00: HSOUT0 isn't enabled after startup
- TTTTTT01: TTTTTT * 100ms, e.g. 33 * 100ms → 0x85 (10000101)
- 0x02: HSOUT0 is enabled after startup and isn't disabled
- 0x03: HSOUT0 is enabled with respect to CP and PP

Request: 04 2E FD 03 XX FF FF FF
Response: 03 6E FD 03 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present HSOUT0 configuration, the following communication has to be executed.

4. Read HSOUT0 configuration:
Request: 03 22 FD 03 FF FF FF FF
Response: 04 62 FD 03 XX FF FF FF

5.2.1.2.3 Configuration of High Side Output Diagnostic Mode

The VC-EVCC provides the possibility to activate or deactivate the active off-state diagnostics of the HSOUT0, HSOUT1 and HSOUT4. If the active off-state diagnostic is configured as “On” the VC-EVCC will detect ShortToGnd and OpenLoad faults even if the corresponding HSOUT is disabled.

The service structure is defined as 1 byte.

Bit Pos.	Description	Value
0	HSOUT0 Active off-state diagnostics	Off: 0 (default) On: 1
1	HSOUT1 Active off-state diagnostics	Off: 0 (default) On: 1
2	HSOUT4 Active off-state diagnostics	Off: 0 (default) On: 1

Note

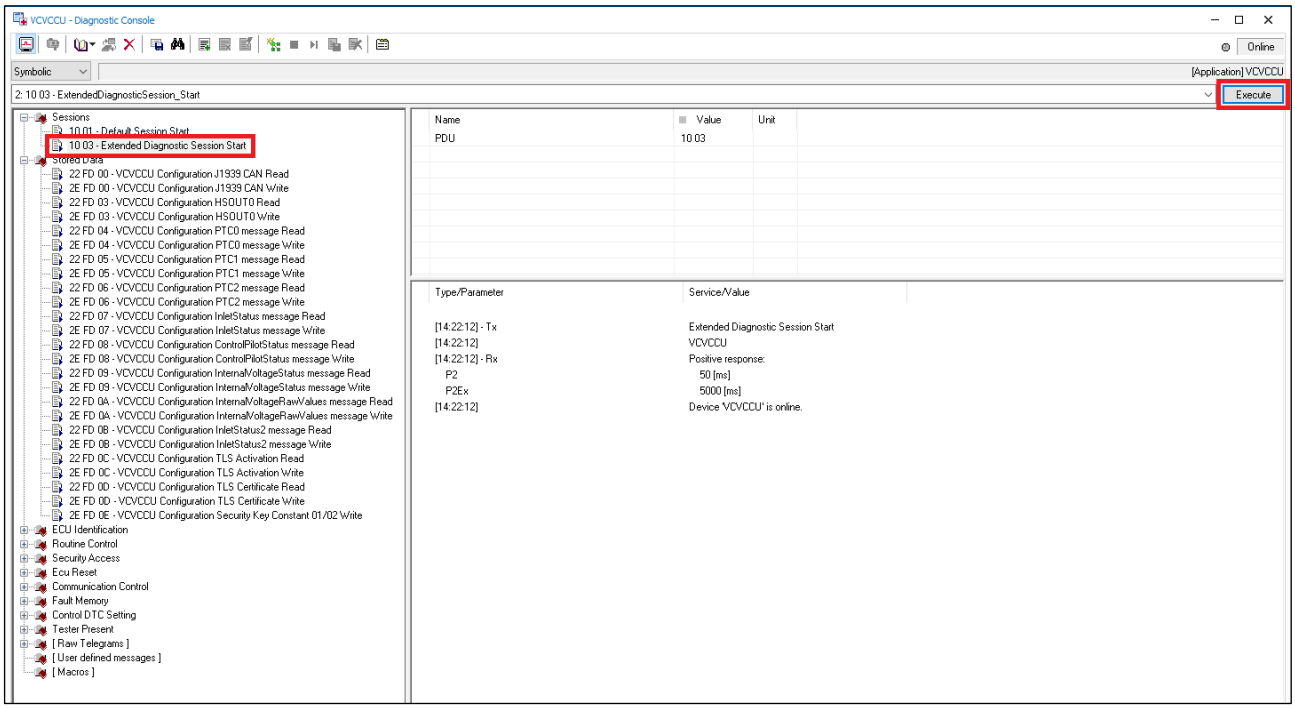
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

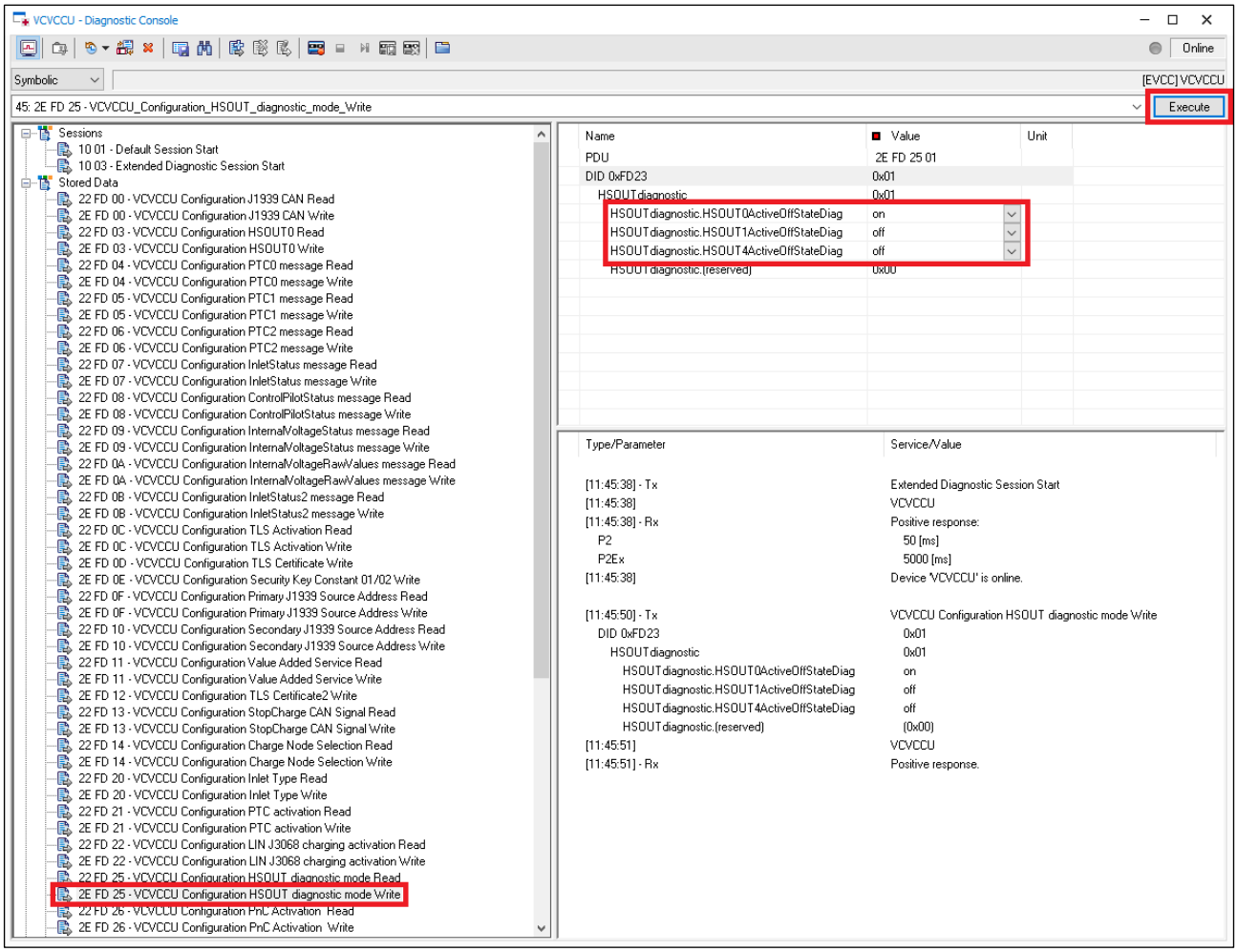
Configuration with CANoe/CANalyzer

The configuration of the High Side Output diagnostic mode can be executed with CANoe/CANalyzer according to the following description.

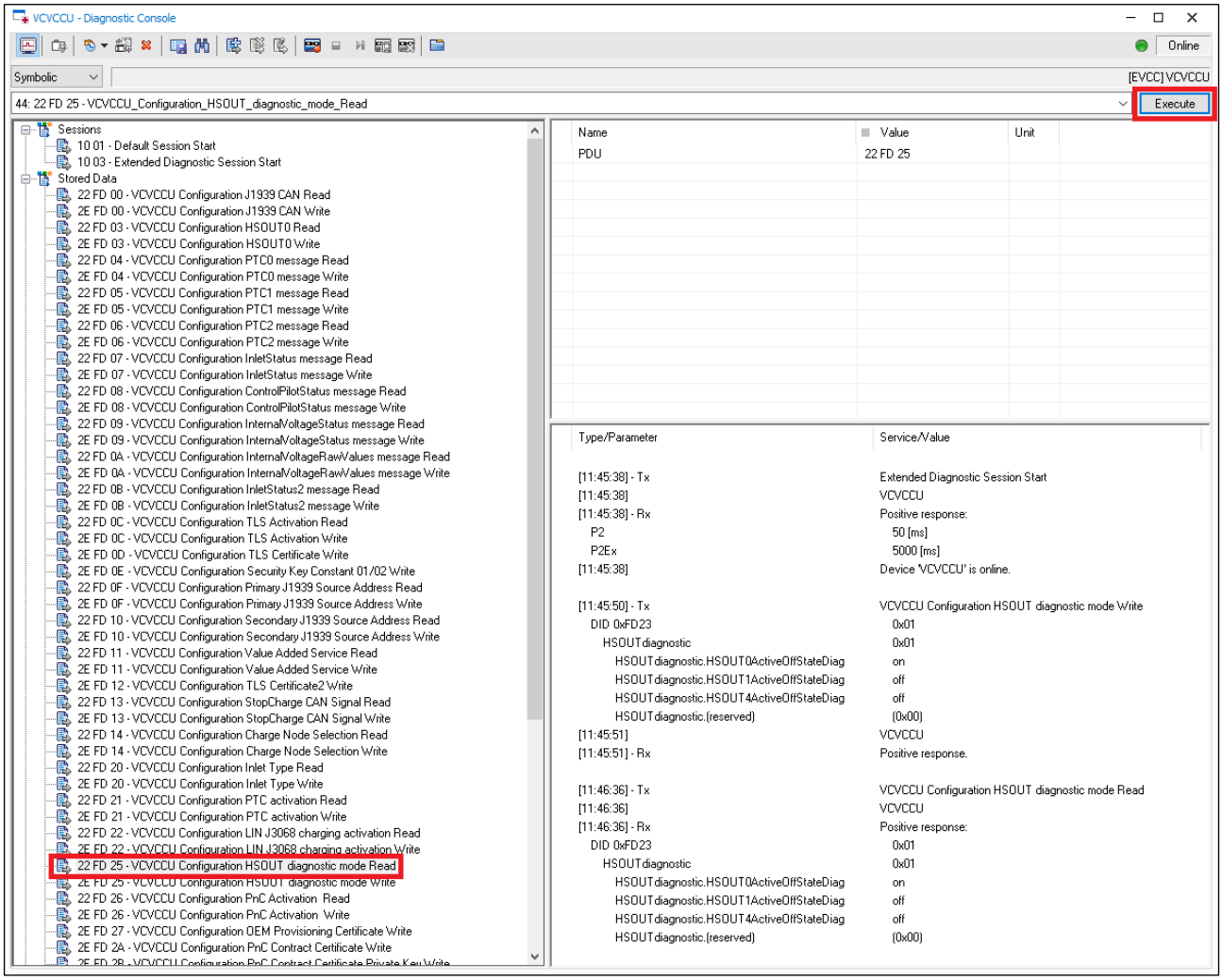
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 25 – VCVCCU Configuration HSOUT diagnostic mode Write”. Please choose the requested HSOUT diagnostic mode configuration and click on the button “Execute”. Please note that the response must be positive.



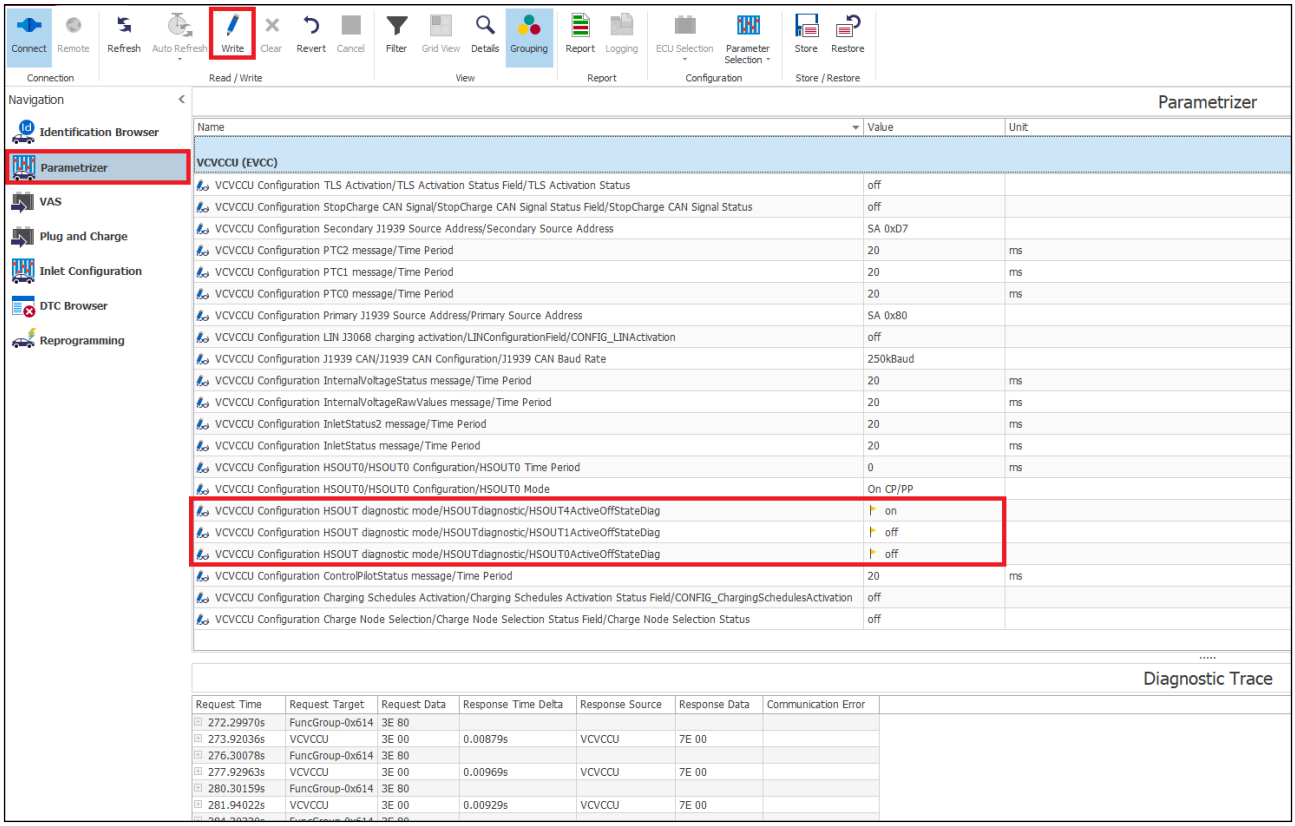
3. By executing the command “22 FD 25 – VCVCCU Configuration HSOUT diagnostic mode Read” the current HSOUT diagnostic mode configuration can be verified.



Configuration with Indigo

The configuration of the HSOUT diagnostic mode can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the data field Value of the requested High Side Output (HSOUT0, HSOUT1 or HSOUT4). Select the requested HSOUT diagnostic mode configuration (“on” or “off”) and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. HSOUT diagnostic mode configuration:
XX: HSOUT Active off-state diagnostics
- 0000 000Xb: HSOUT0 Active off-state diagnostics (Off: 0, On: 1)
- 0000 00X0b: HSOUT1 Active off-state diagnostics (Off: 0, On: 1)
- 0000 0X00b: HSOUT4 Active off-state diagnostics (Off: 0, On: 1)

Request: 04 2E FD 25 XX FF FF FF
Response: 03 6E FD 25 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present HSOUT diagnostic mode configuration, the following communication has to be executed.

4. Read HSOUT diagnostic mode configuration:
Request: 03 22 FD 25 FF FF FF FF
Response: 04 62 FD 25 XX FF FF FF

5.2.1.2.4 Configuration of Message Cycle Times

The VC-EVCC provides the possibility to configure message cycle times of certain CAN messages of the J1939 database.

Message	CAN-Identifier
VCVCCU_PTC0	0x18FF1080
VCVCCU_PTC1	0x18FF1180
VCVCCU_PTC2	0x18FF1280
VCVCCU_InletStatus	0x18FF1380
VCVCCU_ControlPilotStatus	0x18FF1480
VCVCCU_InternalVoltageStatus	0x18FF1880
VCVCCU_InternalVoltageRawValues	0x18FF1980
VCVCCU_InletStatus2	0x18FF1A80

Table 5-7 CAN Messages with Configurable Cycle Times

Note

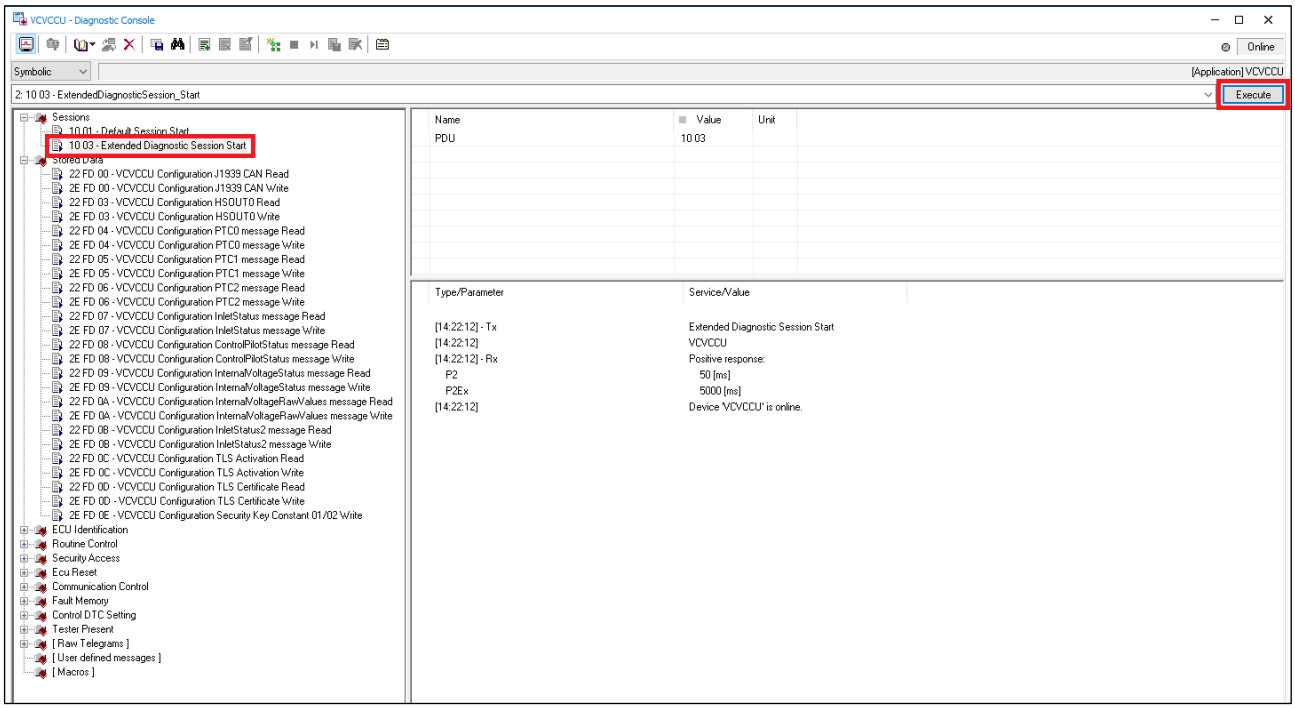
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

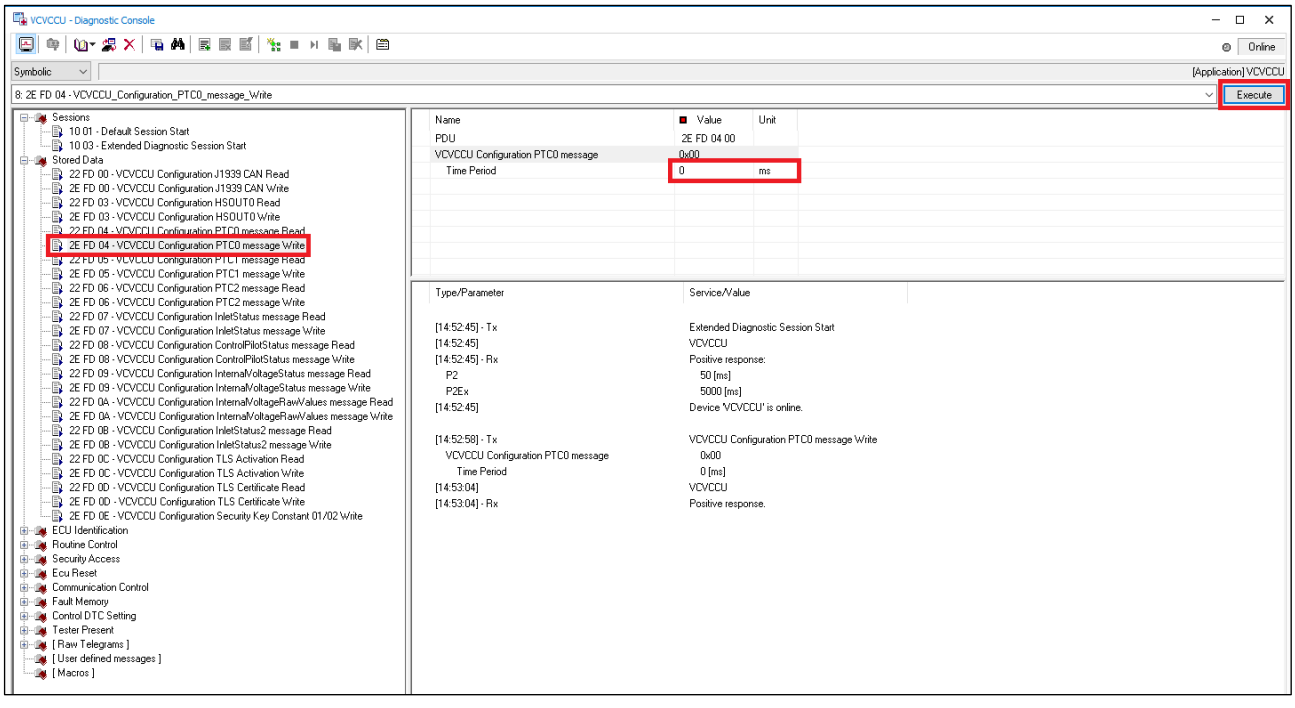
Configuration with CANoe/CANalyzer

The configuration of message cycle times can be executed with CANoe/CANalyzer according to the following description.

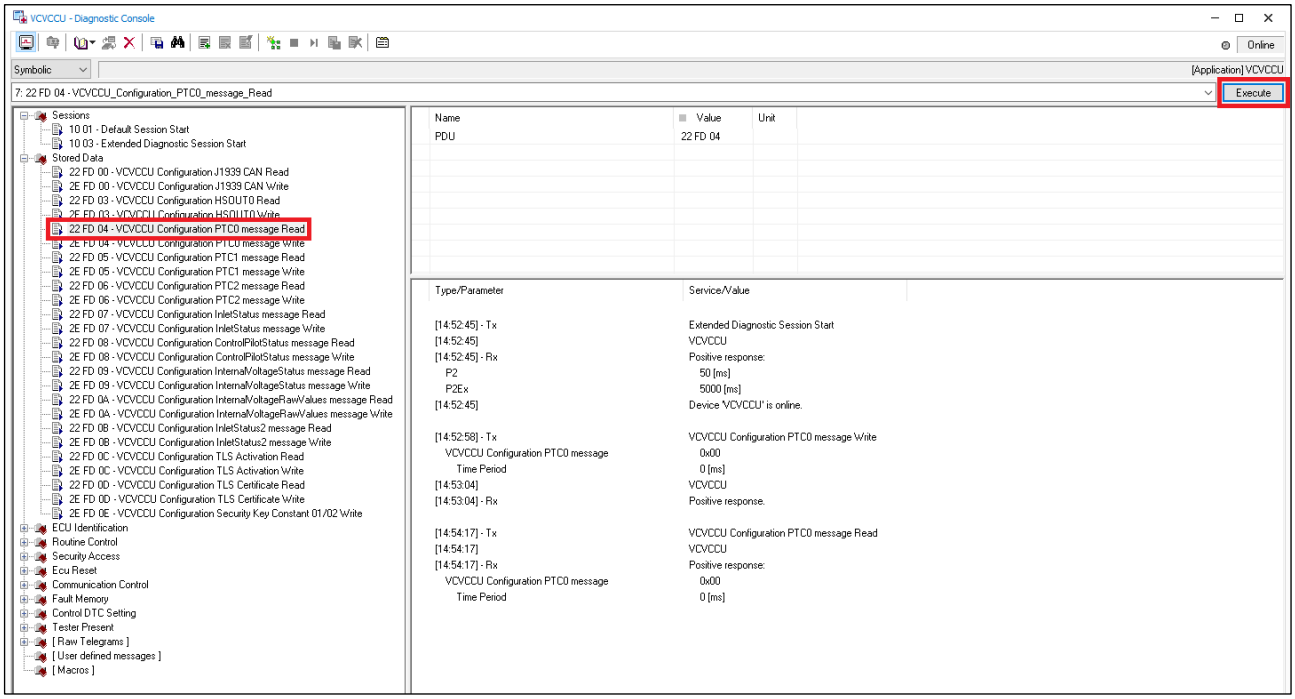
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and select the message whose cycle time should be configured. Please choose the requested time period (cycle time) and click on the button “Execute”. Please note that the response must be positive.



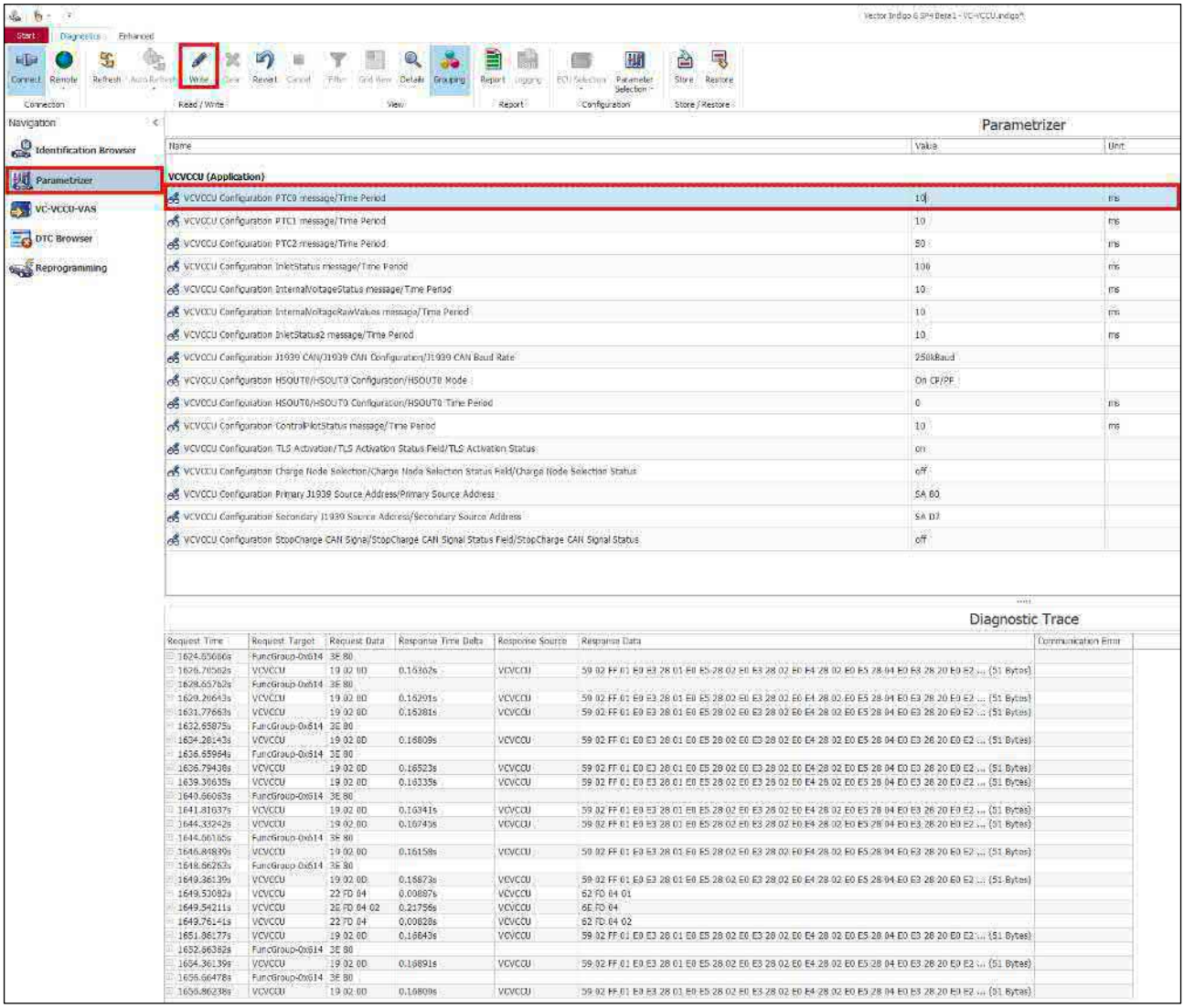
3. By executing the “Read”-command of the corresponding message the current configuration of the message cycle time can be verified.



Configuration with Indigo

The configuration of message cycle times can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the data field Value of the message to be configured, for example “VCVCCU Configuration PTC0 message/Time Period”. Enter the requested message cycle time and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Message cycle time:
XX:
- 0x00: CAN Message isn’t transmitted
- 0x01 … 0xFF: CAN Message is transmitted with a cycle time of Value * 10ms (10ms … 2550ms)

Request: 04 2E FD 0X XX FF FF FF
Response: 03 6E FD 0X FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

The data identifiers (in blue) of CAN messages with configurable message cycle times are listed below.

Message	Data Identifier (DID)
VCVCCU_PTC0	FD 04

VCVCCU_PTC1	FD 05
VCVCCU_PTC2	FD 06
VCVCCU_InletStatus	FD 07
VCVCCU_ControlPilotStatus	FD 08
VCVCCU_InternalVoltageStatus	FD 09
VCVCCU_InternalVoltageRawValues	FD 0A
VCVCCU_InletStatus2	FD 0B

Table 5-8 Data Identifiers for Message Cycle Time Configuration

In order to read the present message cycle time configuration, the following communication has to be executed.

4. Read message cycle time configuration:
Request: 03 22 FD 0X FF FF FF FF
Response: 04 62 FD 0X XX FF FF FF

5.2.1.2.5 Configuration of StopCharge CAN Signal

The VC-EVCC provides the possibility to use the CAN-signal VCVCCU_Vehicle_StopCharge to stop charging and unlocking the plug.

The service structure is defined as 1 byte.

Value	Description
0x00	StopCharge via CAN signal feature is deactivated (default)
0x01	StopCharge via CAN signal feature is activated

Note

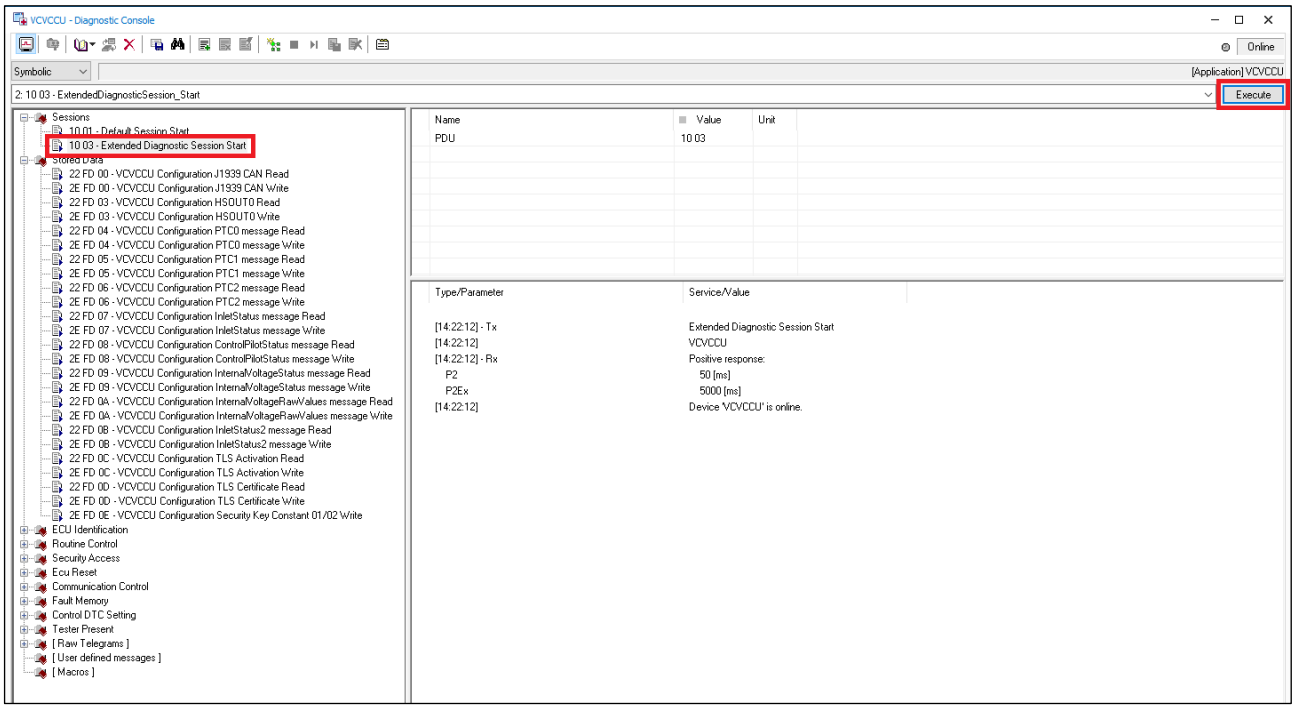
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

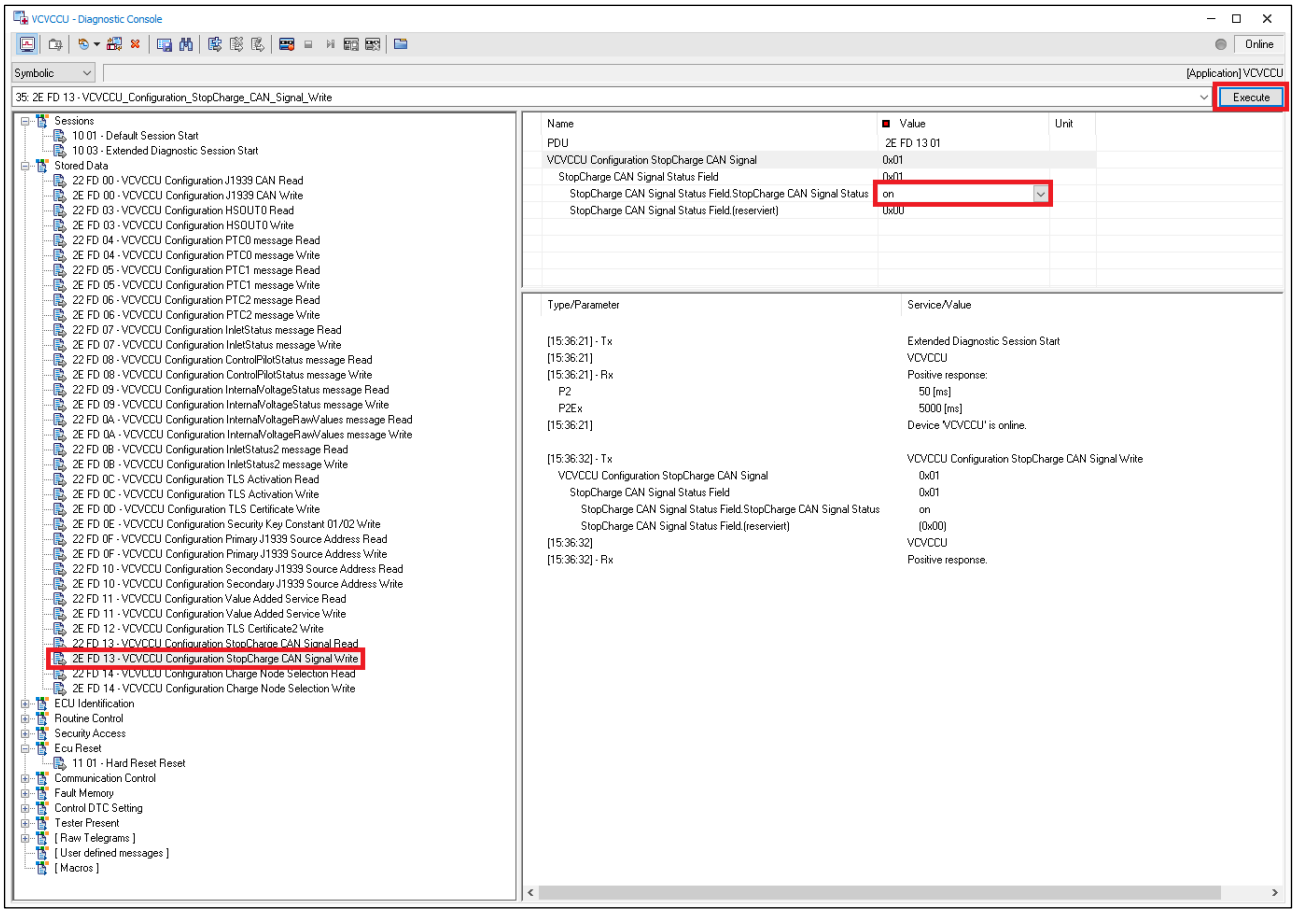
Configuration with CANoe/CANalyzer

The configuration of the StopCharge CAN signal can be executed with CANoe/CANalyzer according to the following description.

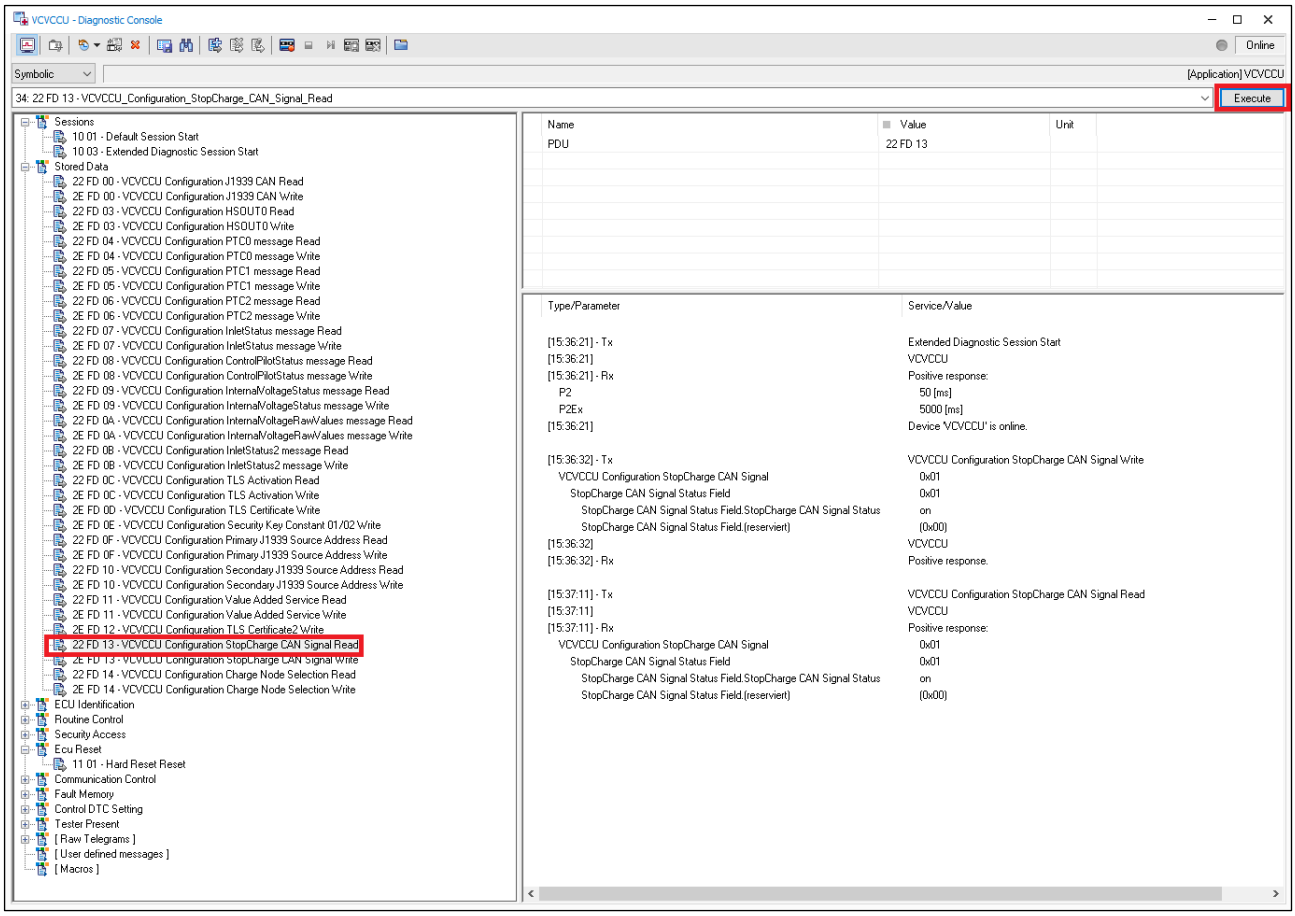
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 13 – VCVCCU Configuration StopCharge CAN Signal Write”. Please choose the requested StopCharge CAN Signal configuration (“on” or “off”) and click on the button “Execute”. Please note that the response must be positive.



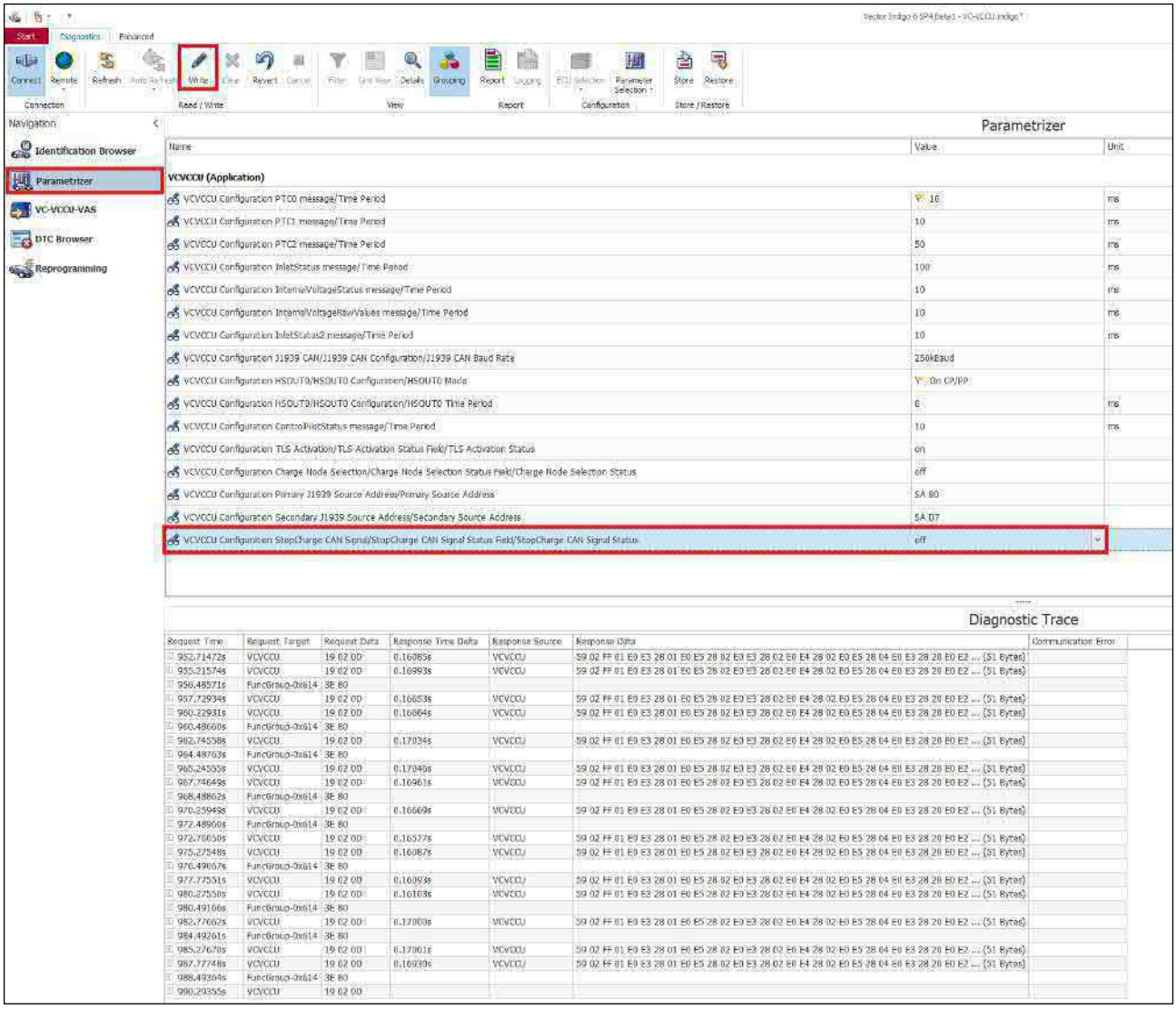
3. By executing the command “22 FD 13 – VCVCCU Configuration StopCharge CAN Signal Read” the current configuration of the StopCharge CAN Signal can be verified.



Configuration with Indigo

The configuration of the StopCharge CAN Signal can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration StopCharge CAN Signal/StopCharge CAN Signal Status Field/StopCharge CAN Signal Status”. Select the requested StopCharge CAN Signal configuration and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. StopCharge CAN Signal:
XX:
- 0x00: StopCharge via CAN signal feature is deactivated
- 0x01: StopCharge via CAN signal feature is activated

Request: 04 2E FD 13 XX FF FF FF
Response: 03 6E FD 13 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present configuration of the StopCharge CAN Signal configuration, the following communication has to be executed.

4. Read StopCharge CAN Signal configuration:
Request: 03 22 FD 13 FF FF FF FF
Response: 04 62 FD 13 XX FF FF FF

5.2.1.2.6 Configuration of Primary J1939 Source Address (Charging Arbitration)

The VC-EVCC provides the possibility to configure the Primary J1939 Source Address. The following source address values are available for selection

Description	Source Address Value
Primary Source Address	0x80 (default)
Primary Source Address	0xD7
Primary Source Address	0xD8
Primary Source Address	0xD9
Primary Source Address	0xDA
Primary Source Address	0xDB
Primary Source Address	0xDC
Primary Source Address	0xDD
Primary Source Address	0xDE
Primary Source Address	0xDF

Note

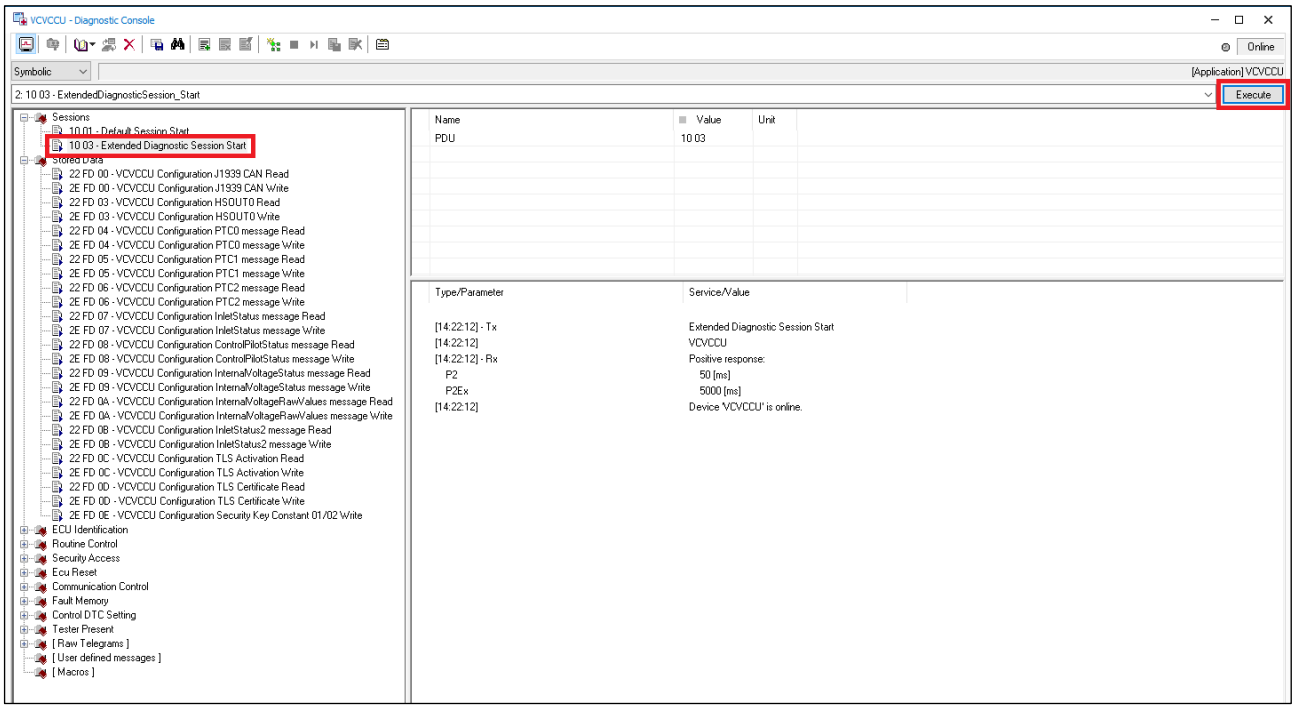
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

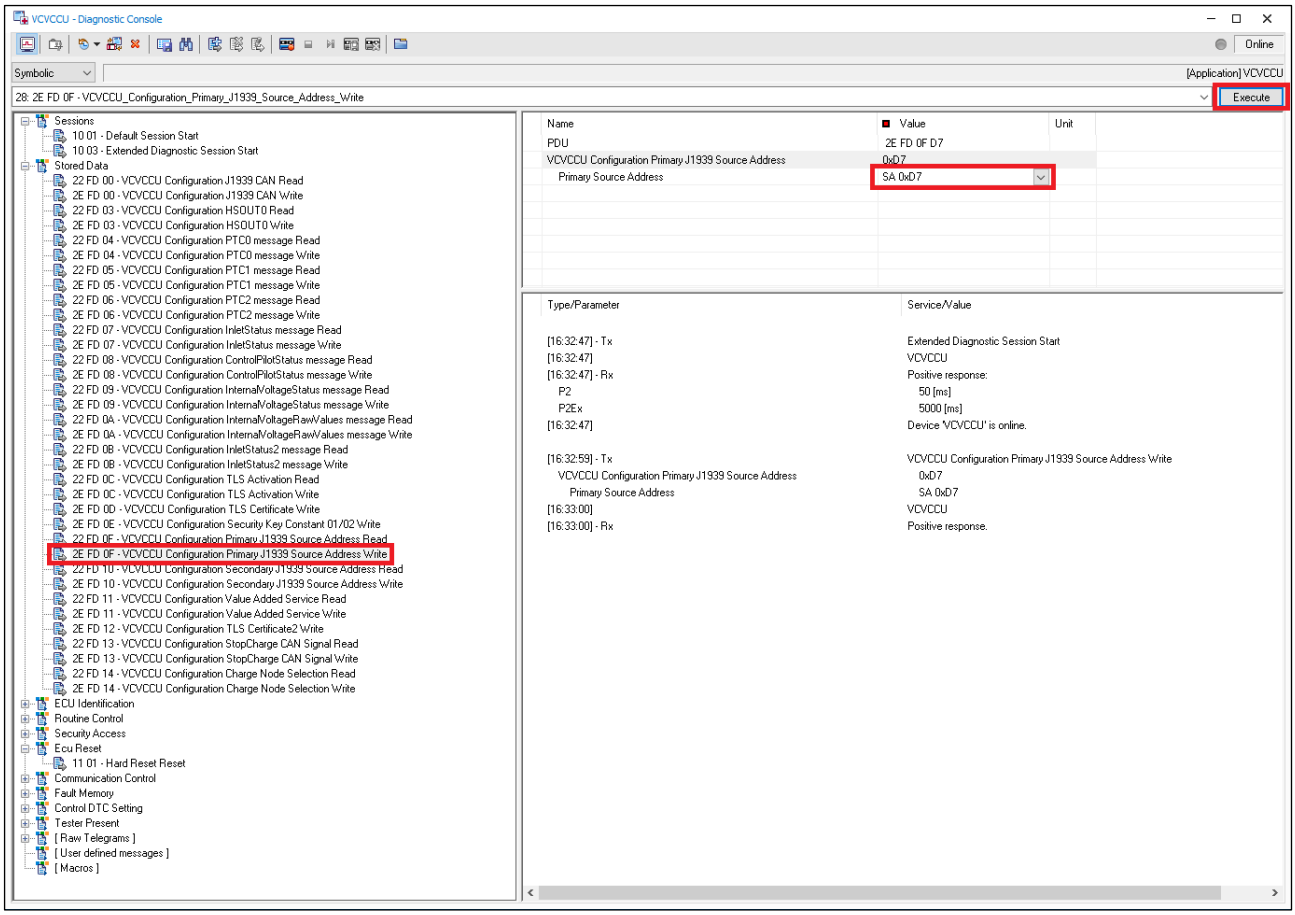
Configuration with CANoe/CANalyzer

The configuration of the Primary J1939 Source Address can be executed with CANoe/CANalyzer according to the following description.

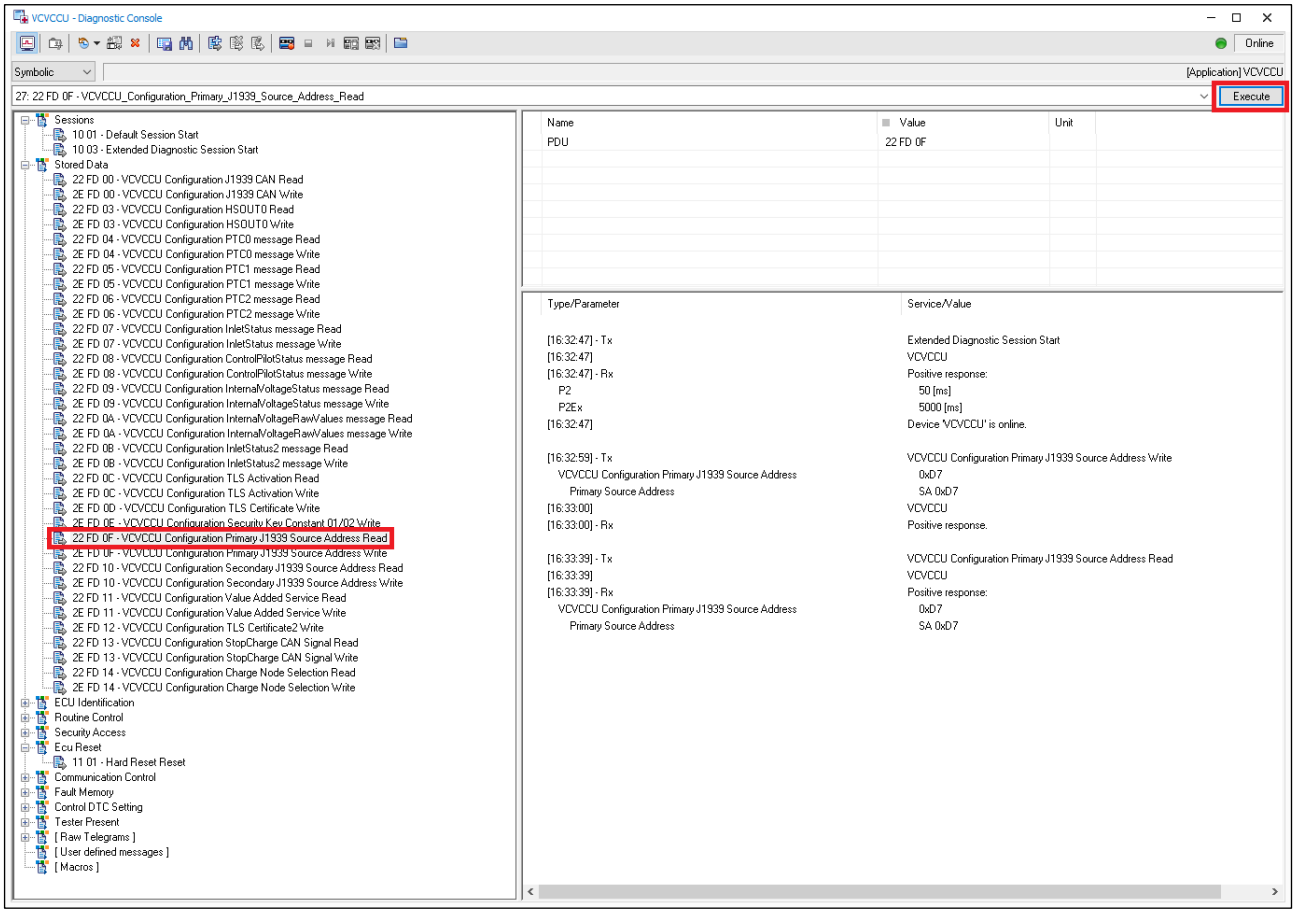
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 0F – VCVCCU Configuration Primary J1939 Source Address Write”. Please choose the requested Primary Source Address and click on the button “Execute”. Please note that the response must be positive.



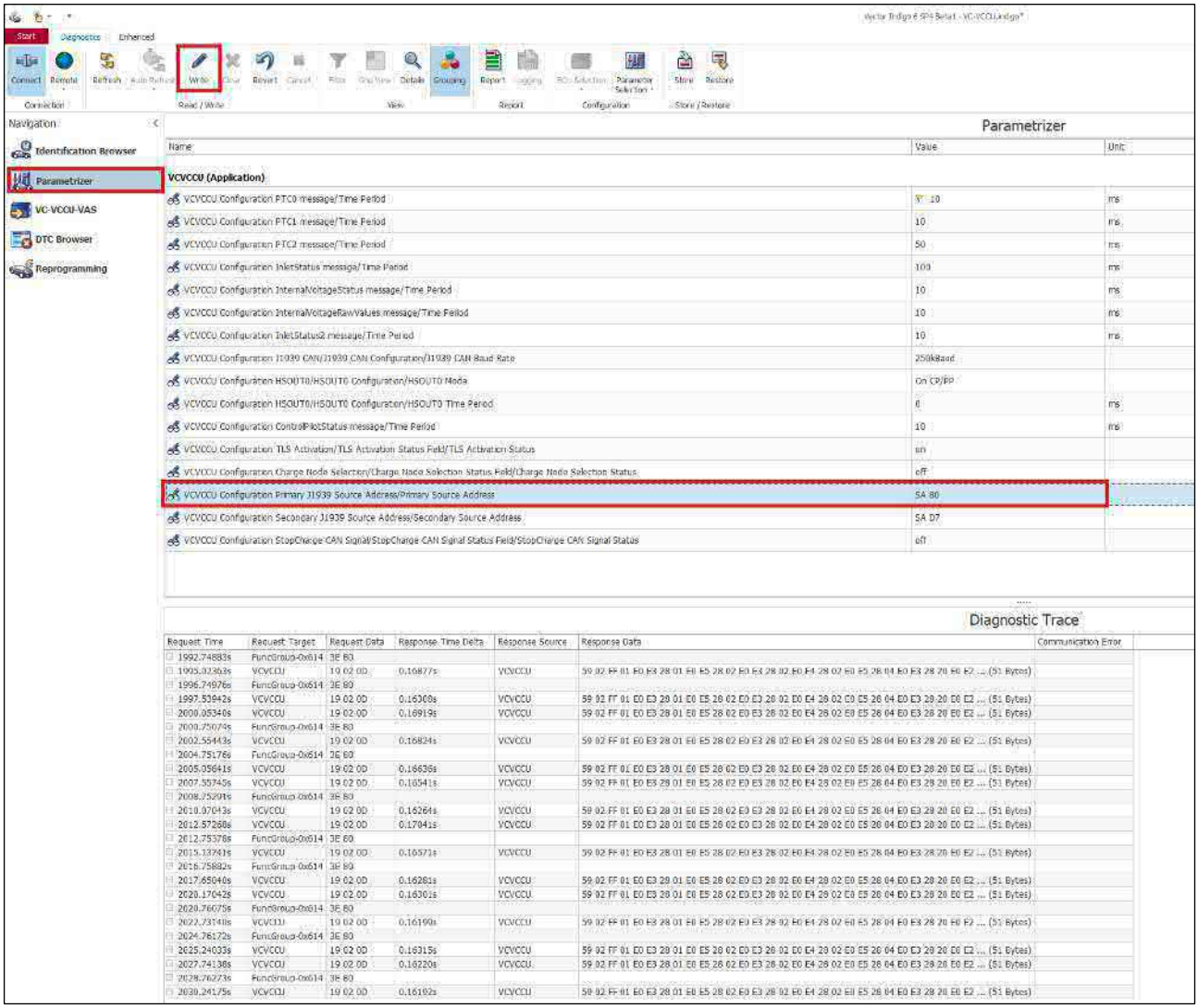
3. By executing the command “22 FD 0F – VCVCCU Configuration Primary J1939 Source Address Read” the current Primary Source Address can be verified.



Configuration with Indigo

The configuration of the Primary J1939 Source Address can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration Primary J1939 Source Address/Primary Source Address”. Select the requested Primary J1939 Source Address and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Primary J1939 Source Address:
XX: Selected Primary J1939 Source Address value

Request: 04 2E FD 0F XX FF FF FF
Response: 03 6E FD 0F FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present Primary J1939 Source Address configuration, the following communication has to be executed.

4. Read Primary J1939 Source Address configuration:
Request: 03 22 FD 0F FF FF FF FF
Response: 04 62 FD 0F XX FF FF FF

5.2.1.2.7 Configuration of Secondary J1939 Source Address (Charging Arbitration)

The VC-EVCC provides the possibility to configure the Secondary J1939 Source Address. The following source address values are available for selection

Description	Source Address Value
Secondary Source Address	0x80 (default)
Secondary Source Address	0xD7
Secondary Source Address	0xD8
Secondary Source Address	0xD9
Secondary Source Address	0xDA
Secondary Source Address	0xDB
Secondary Source Address	0xDC
Secondary Source Address	0xDD
Secondary Source Address	0xDE
Secondary Source Address	0xDF

Note

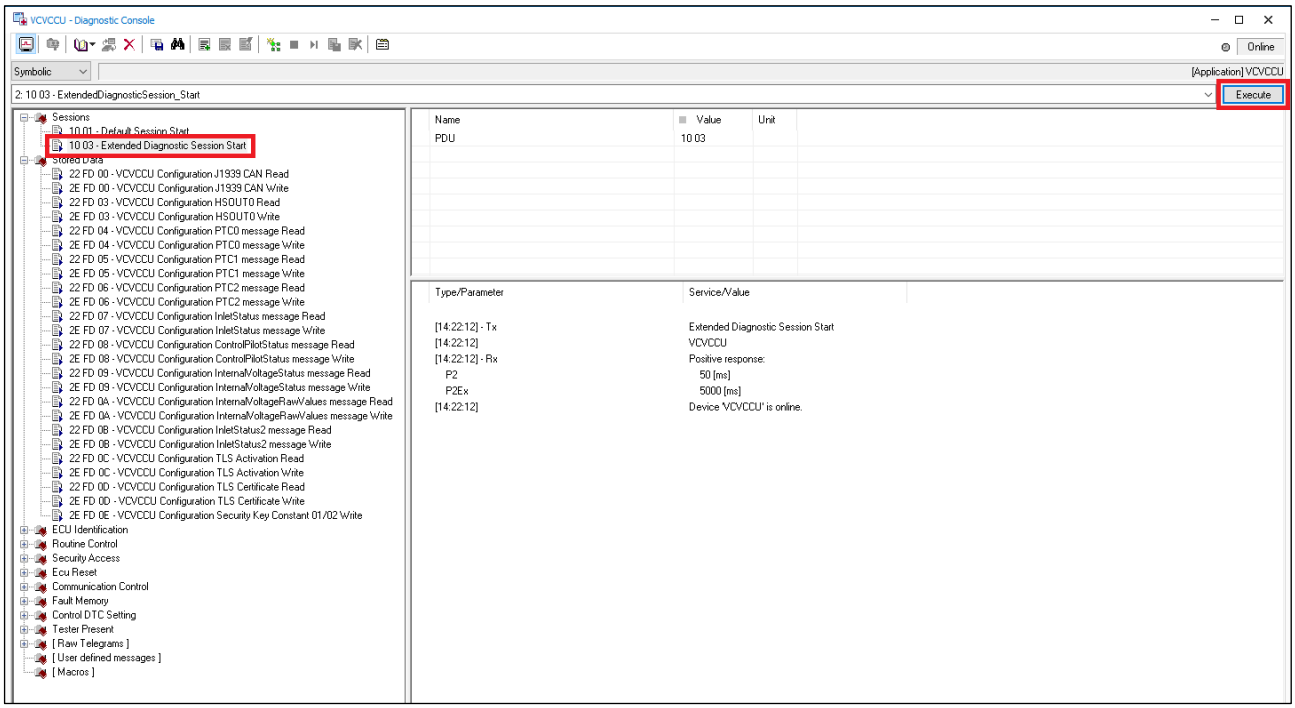
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

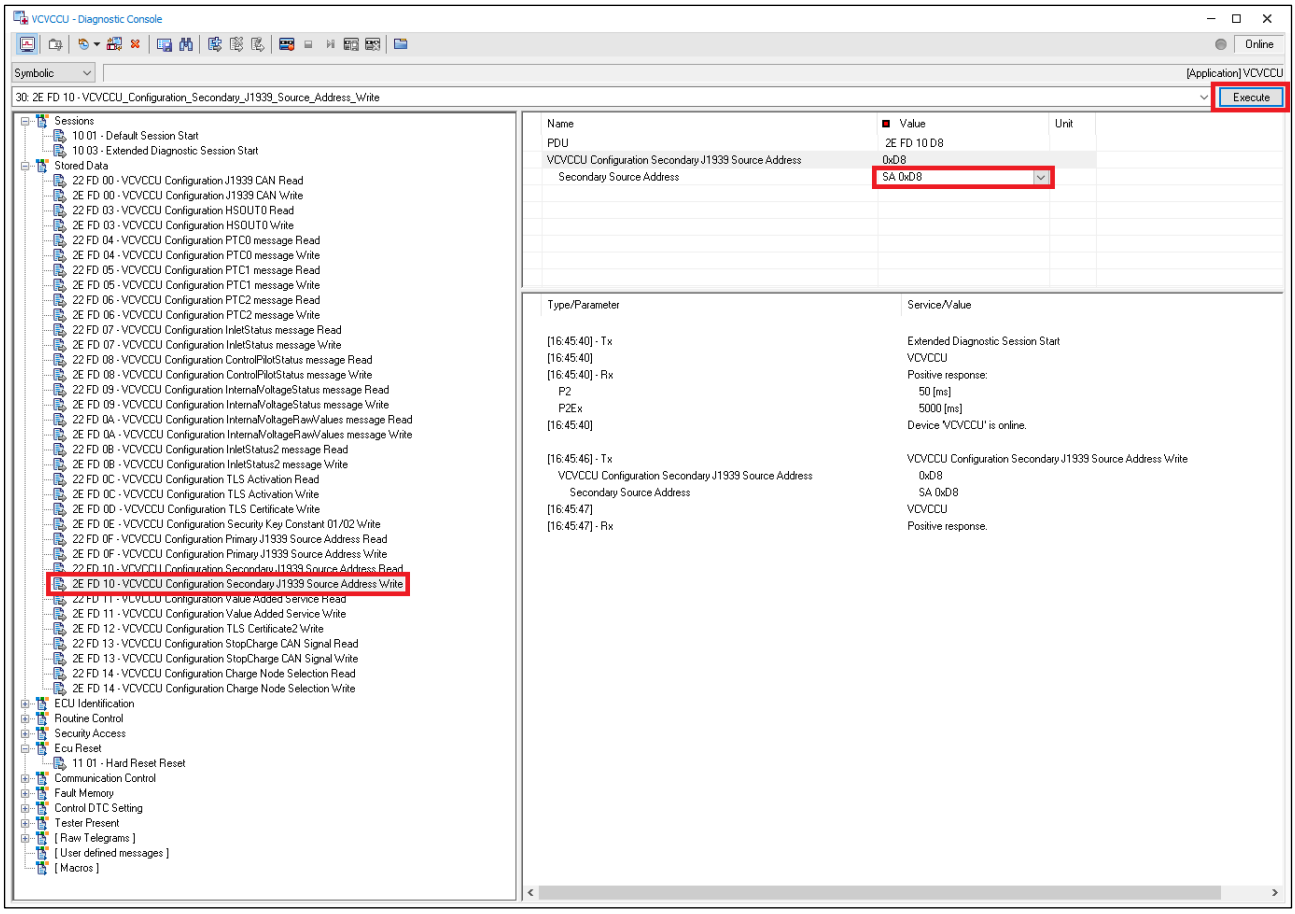
Configuration with CANoe/CANalyzer

The configuration of the Secondary J1939 Source Address can be executed with CANoe/CANalyzer according to the following description.

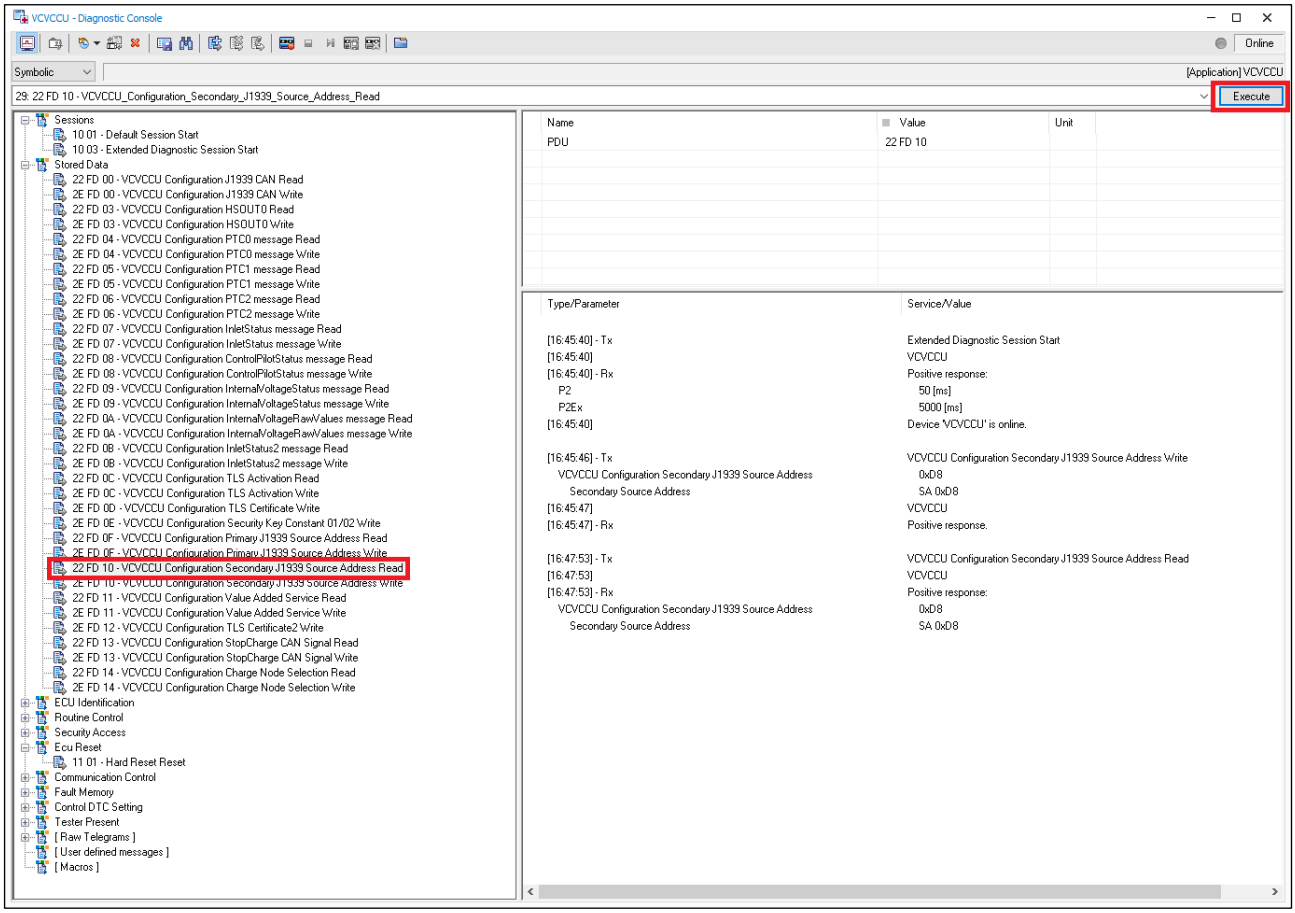
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 10 – VCVCCU Configuration Secondary J1939 Source Address Write”. Please choose the requested Secondary Source Address and click on the button “Execute”. Please note that the response must be positive.



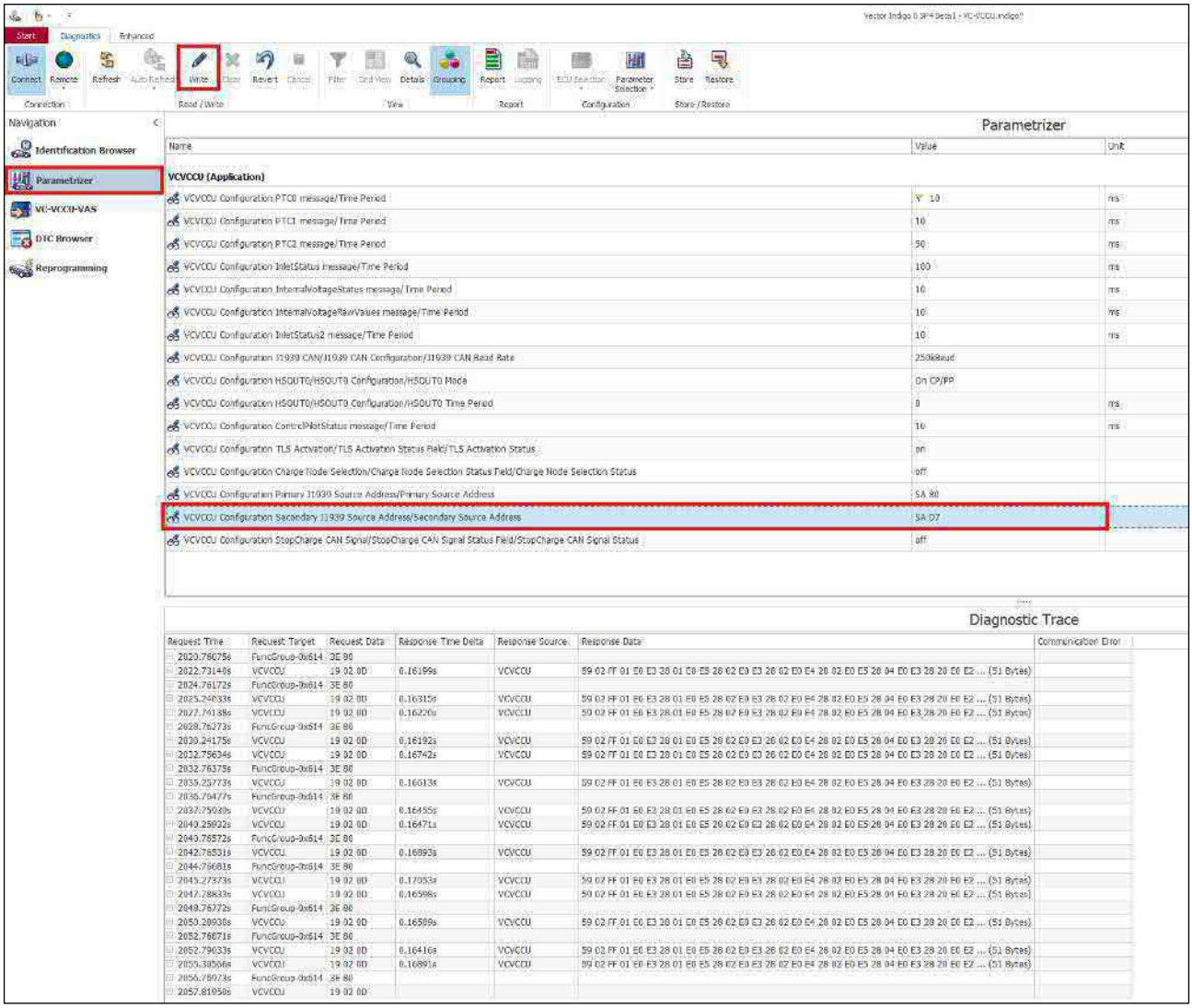
3. By executing the command “22 FD 10 – VCVCCU Configuration Secondary J1939 Source Address Read” the current Secondary Source Address can be verified.



Configuration with Indigo

The configuration of the Secondary J1939 Source Address can be executed with Indigo according to the following description.

2. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration Secondary J1939 Source Address/Secondary Source Address”. Select the requested Secondary J1939 Source Address and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Secondary J1939 Source Address:
XX: Selected Secondary J1939 Source Address value

Request: 04 2E FD 10 XX FF FF FF
Response: 03 6E FD 10 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present Secondary J1939 Source Address configuration, the following communication has to be executed.

4. Read Secondary J1939 Source Address configuration:
Request: 03 22 FD 10 FF FF FF FF
Response: 04 62 FD 10 XX FF FF FF

5.2.1.2.8 Configuration of Charge Node Selection (Charging Arbitration)

The VC-EVCC provides the possibility to use charging arbitration which enables to run two VC-EVCCs with different source addresses on the same CAN channel.

The service structure is defined as 1 byte.

Value	Description
0x00	Charging Arbitration is inactive (default)
0x01	Charging Arbitration is active

Note

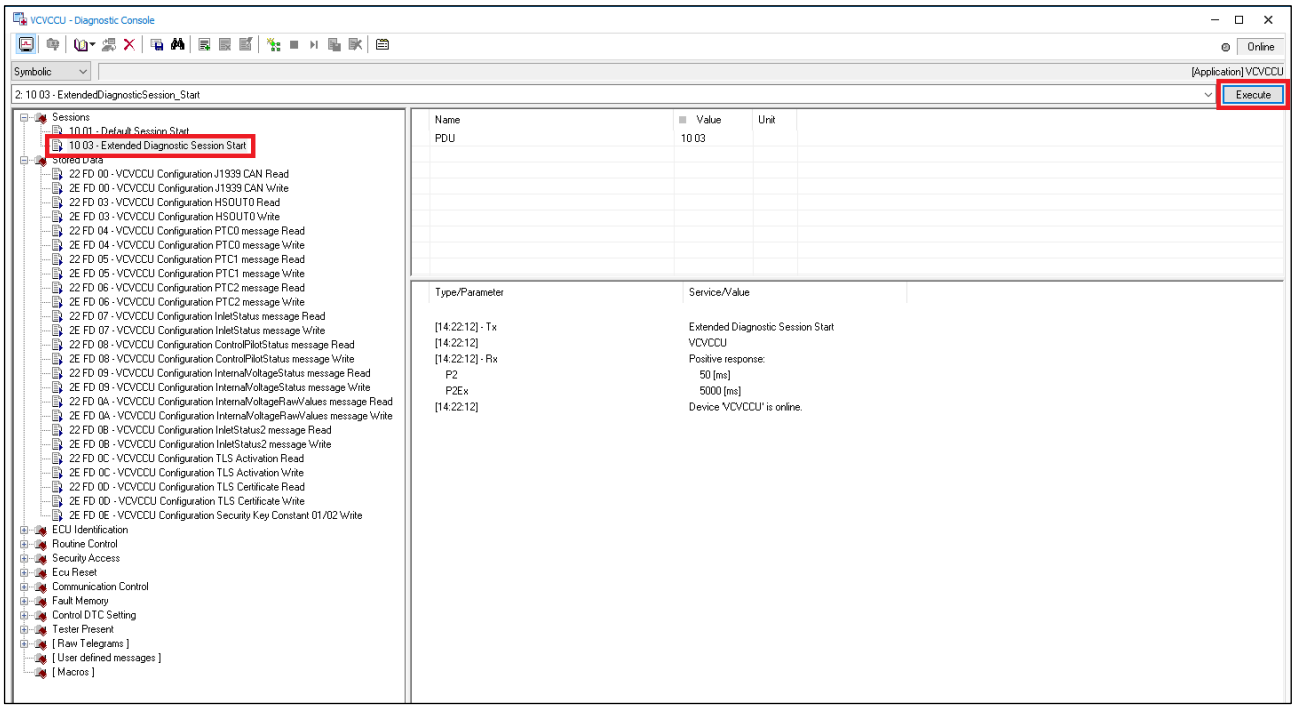
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

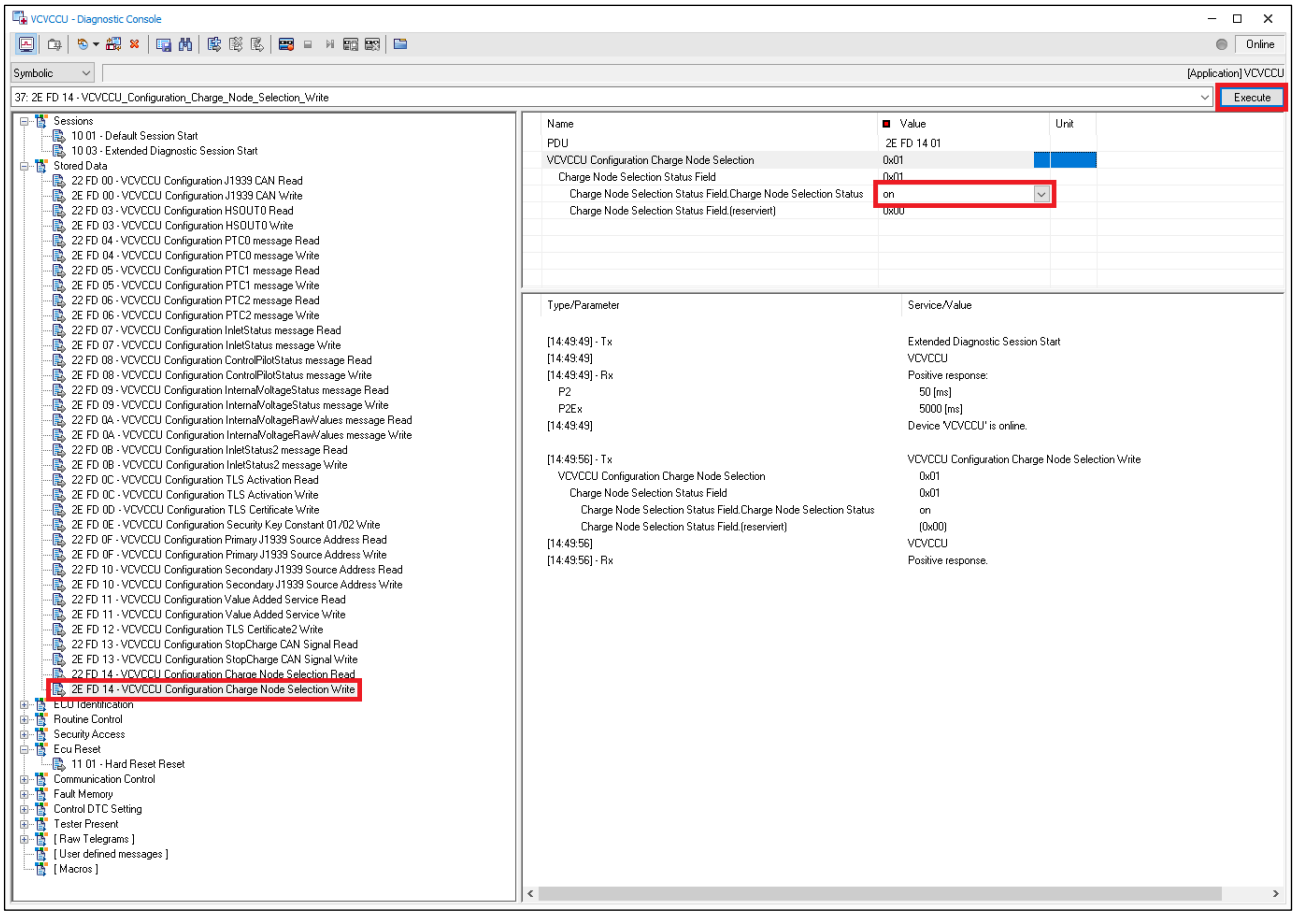
Configuration with CANoe/CANalyzer

The configuration of the Charge Node Selection can be executed with CANoe/CANalyzer according to the following description.

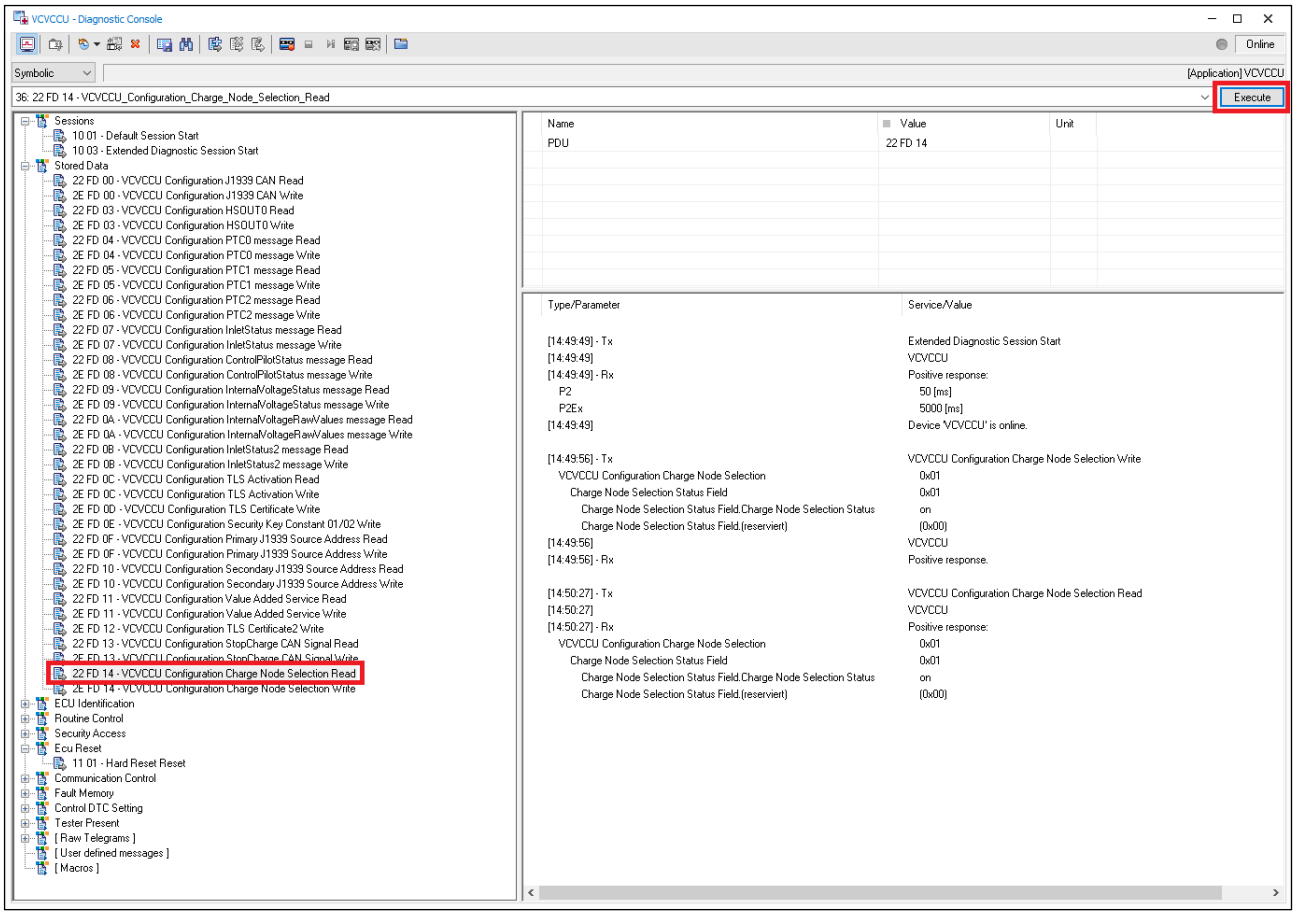
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 14 – VCVCCU Configuration Charge Node Selection Write”. Please choose the requested Charge Node Selection (“on” or “off”) and click on the button “Execute”. Please note that the response must be positive.



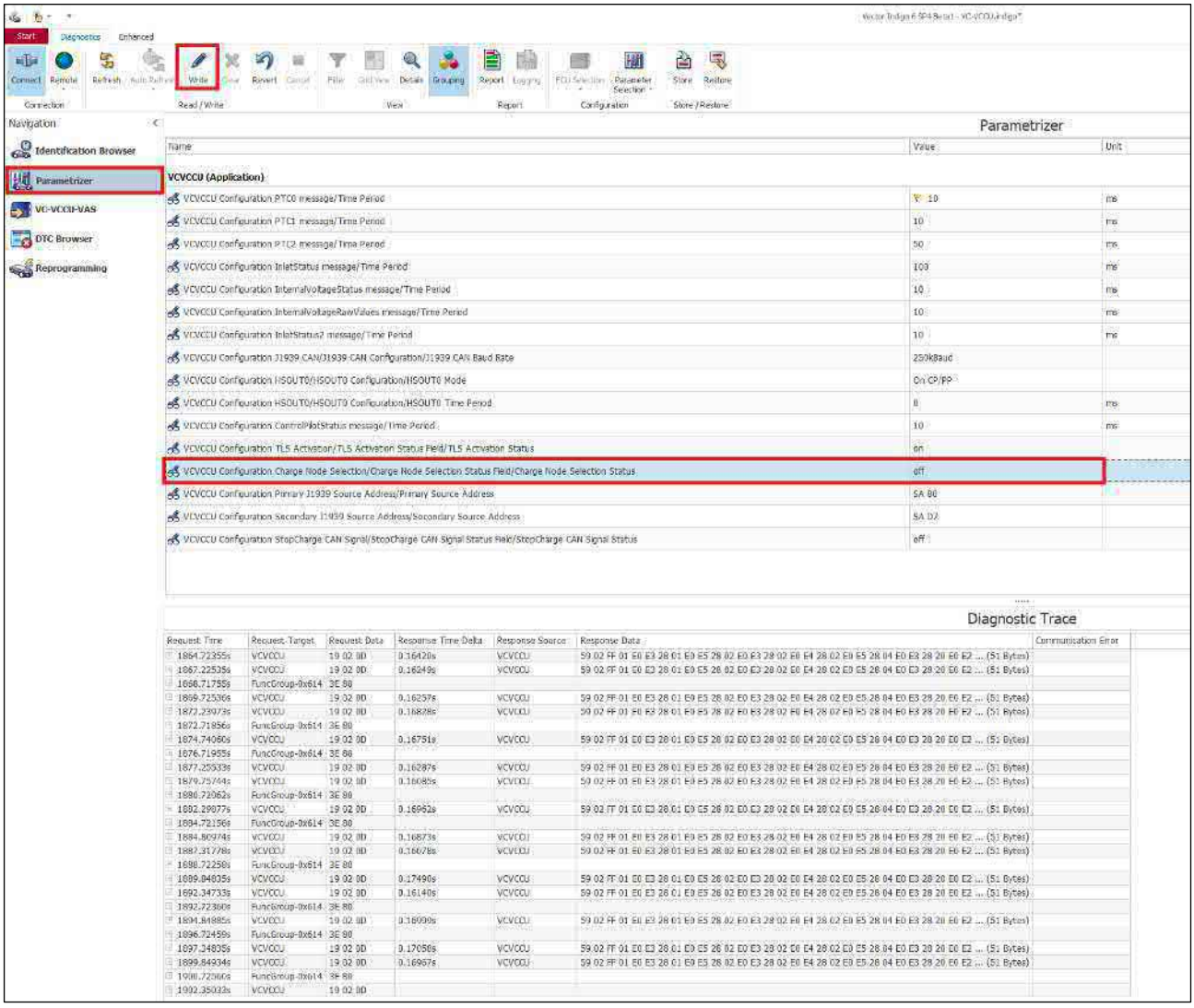
3. By executing the command “22 FD 14 – VCVCCU Configuration Charge Node Selection Read” the current configuration of the Charge Node Selection can be verified.



Configuration with Indigo

The configuration of Charge Node Selection can be executed with Indigo according to the following description.

3. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration Charge Node Selection/Charge Node Selection Status Field/Charge Node Selection Status”. Select the requested Charge Node Selection configuration and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Charge Node Selection:
XX:
- 0x00: Charging Arbitration is inactive
- 0x01: Charging Arbitration is active

Request: 04 2E FD 14 XX FF FF FF
Response: 03 6E FD 14 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present configuration of the Charge Node Selection configuration, the following communication has to be executed.

4. Read Charge Node Selection configuration:
Request: 03 22 FD 14 FF FF FF FF
Response: 04 62 FD 14 XX FF FF FF

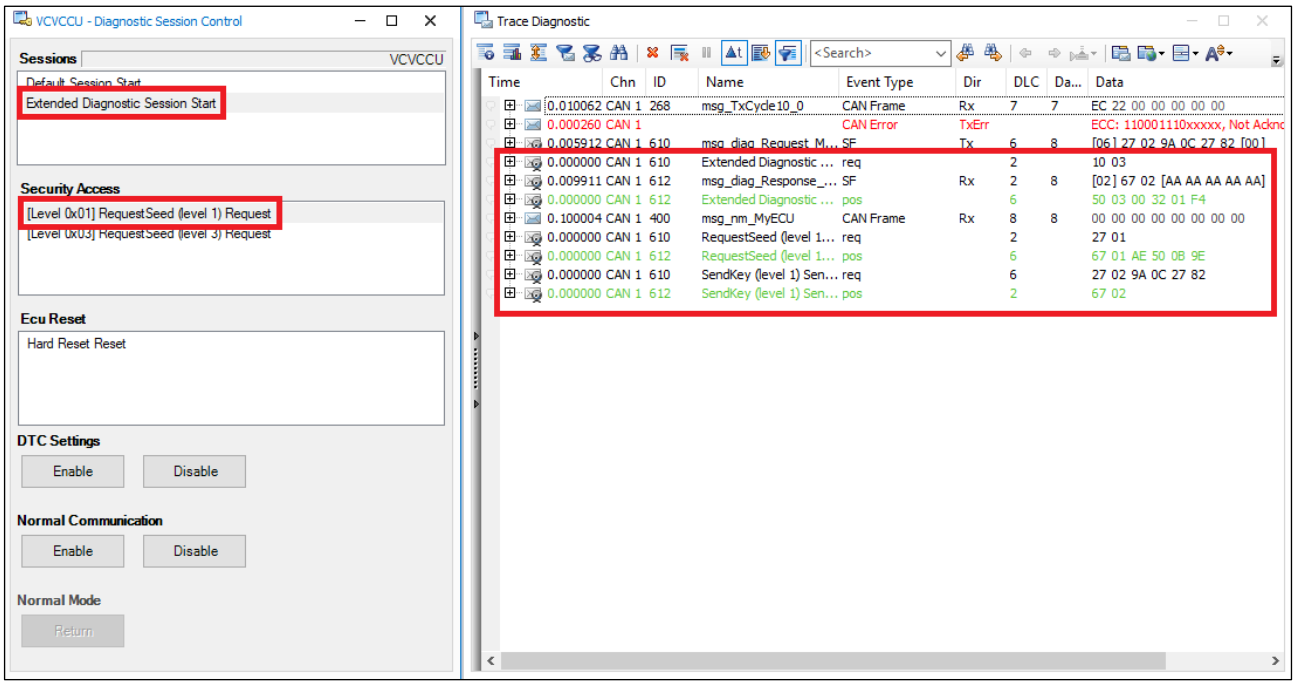
5.2.1.2.9 Configuration of Transport Layer Security – V2G

The VC-EVCC provides the possibility to establish a secure connection to the EVSE using Transport Layer Security (TLS) for V2G communication.

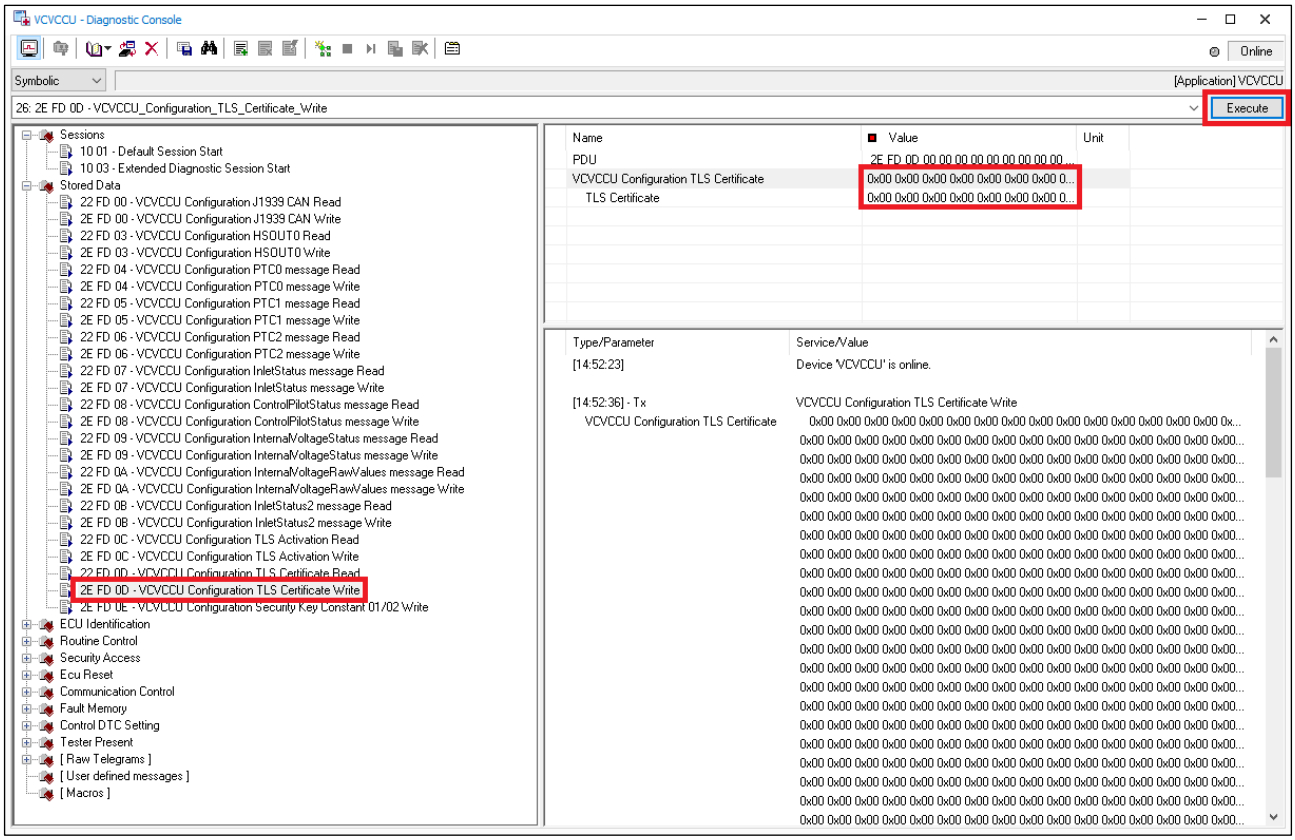
Configuration with CANoe/CANalyzer

The configuration of TLS (V2G) can be executed with CANoe/CANalyzer according to the following description.

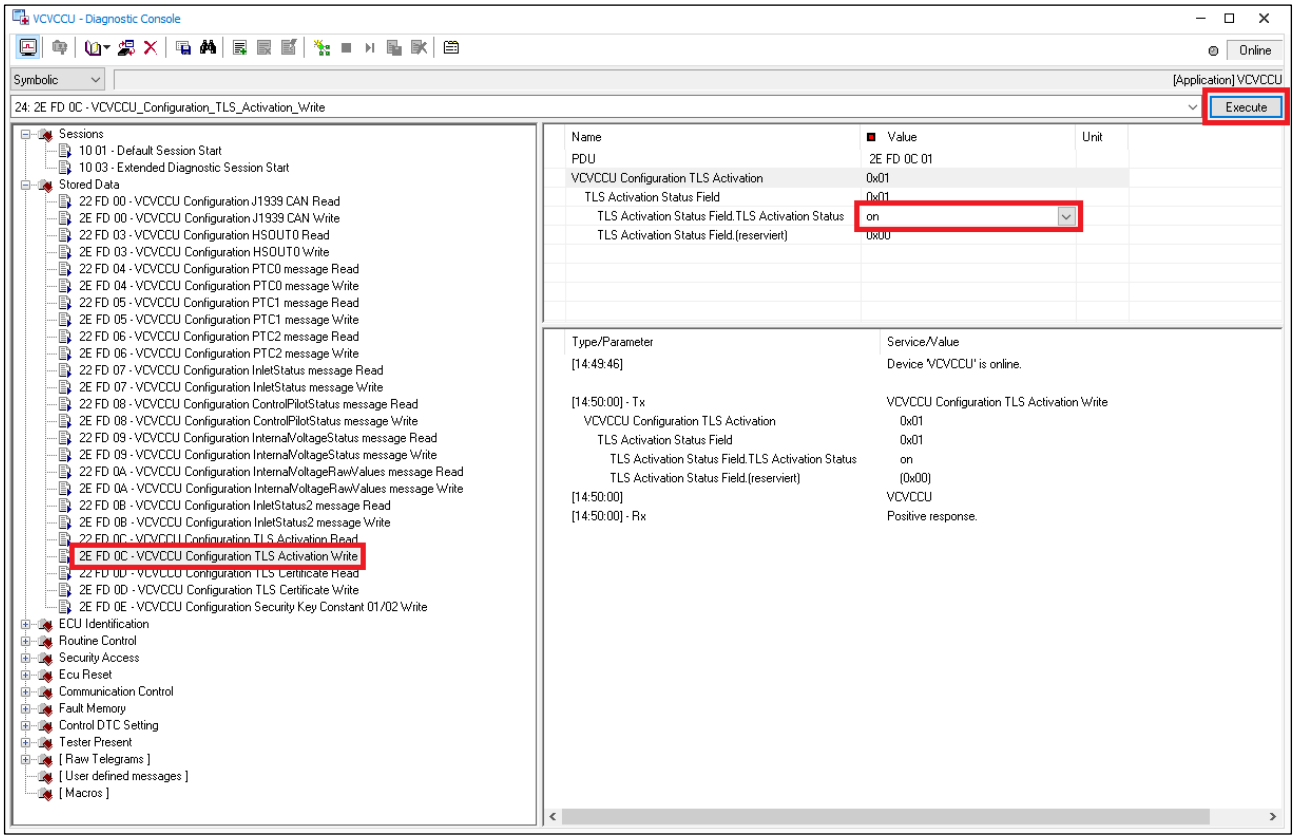
1. The configuration of TLS requires the diagnostic services “Extended Session” and “Security Access”. Therefore, select the window “VCVCCU – Diagnostic Session Control” and double-click on “Extended Session Start”. Continue by double-clicking on “[Level 0x01] Request Seed (level 1) Request”. Please note that the responses must be positive. The request and response messages are shown in the window “Trace Diagnostic”.



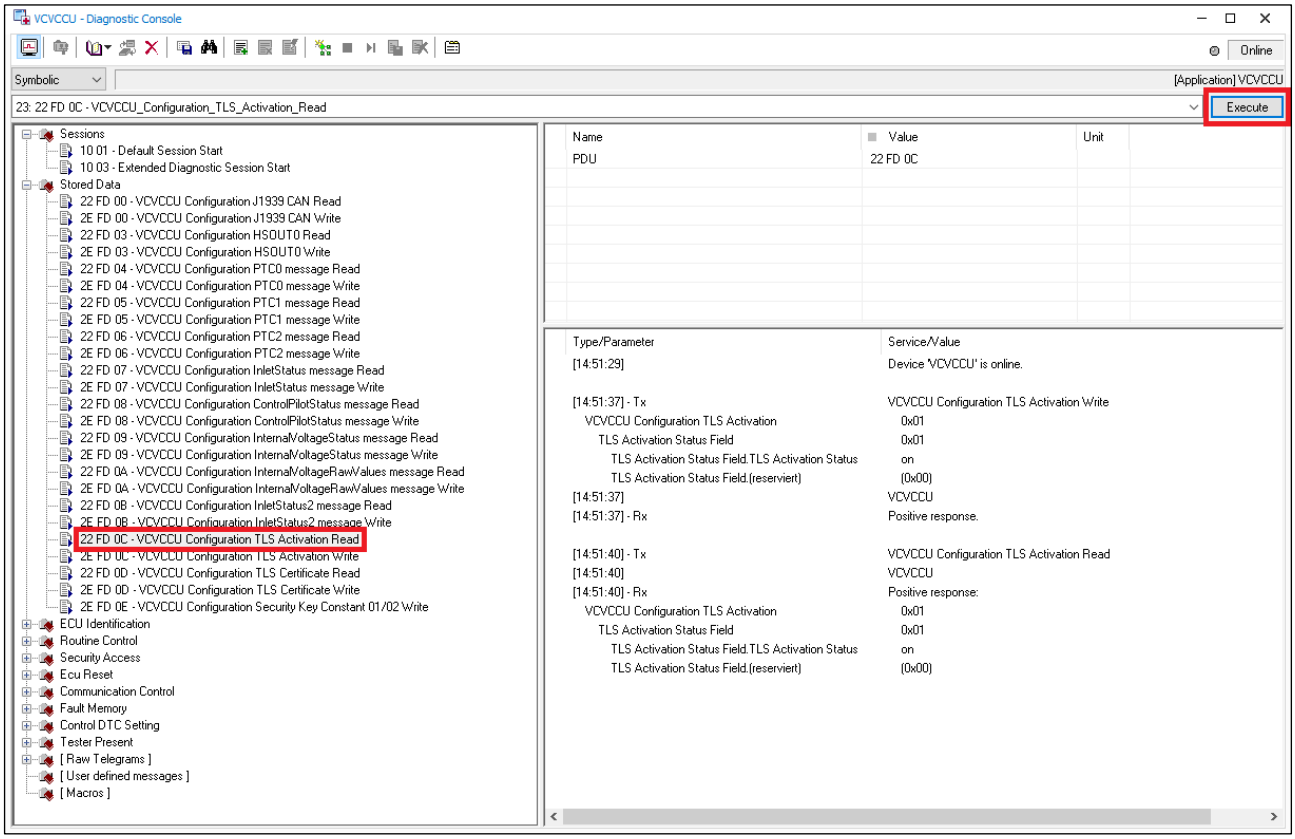
2. To use TLS a certificate must be written. Therefore, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 0D – VCVCCU Configuration TLS Certificate Write”. Write the requested certificate (800 bytes) and click on “Execute”. Please note that the response must be positive.



3. Select the tab “Stored Data” and click on “2E FD 0C – VCVCCU Configuration TLS Activation Write”. Please choose the status “on” (activate) and click on the button “Execute”. Please note that the response must be positive. Once status “off” (deactivate) is selected, the TLS Certificate is set to a default value.



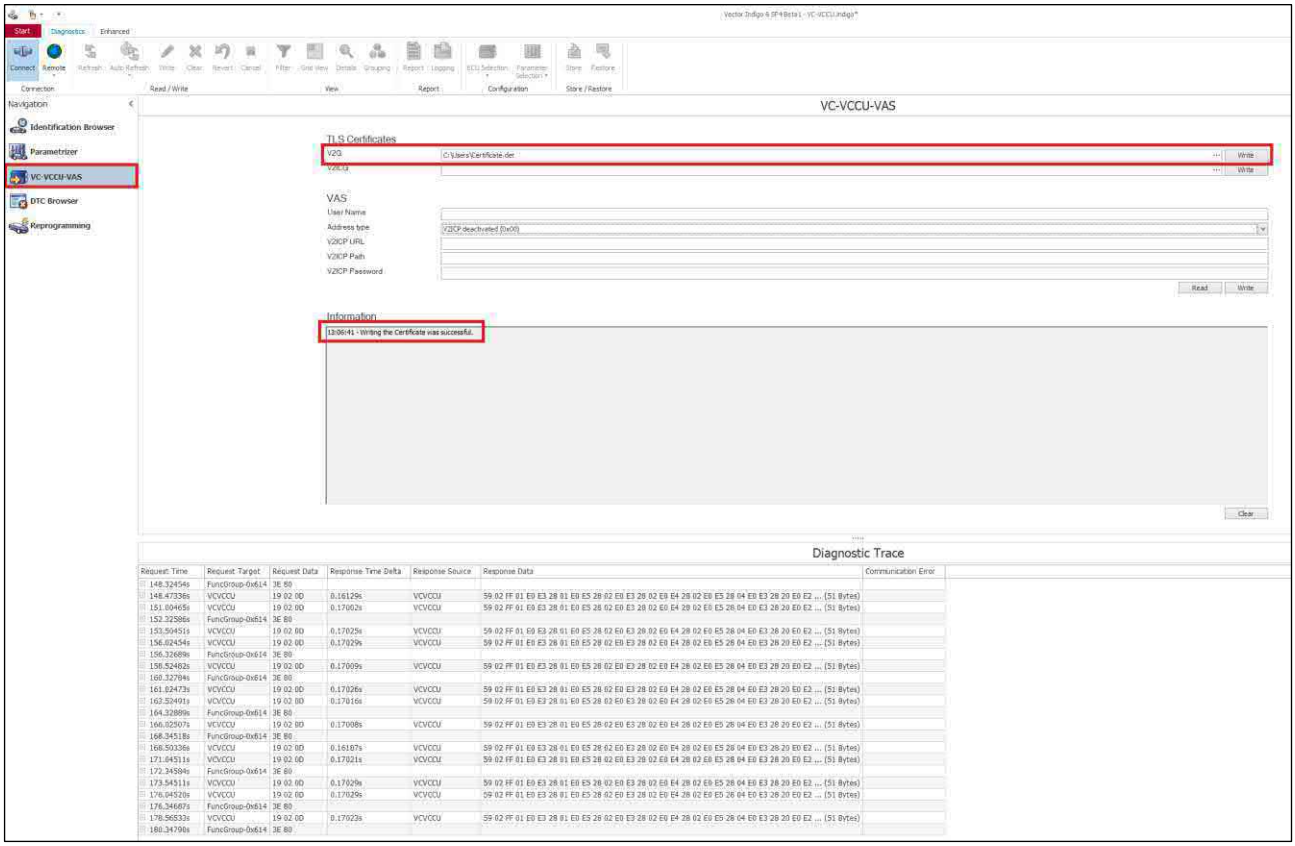
4. By executing the command “22 FD 0C – VCVCCU Configuration TLS Activation Read” the current configuration of TLS can be verified.



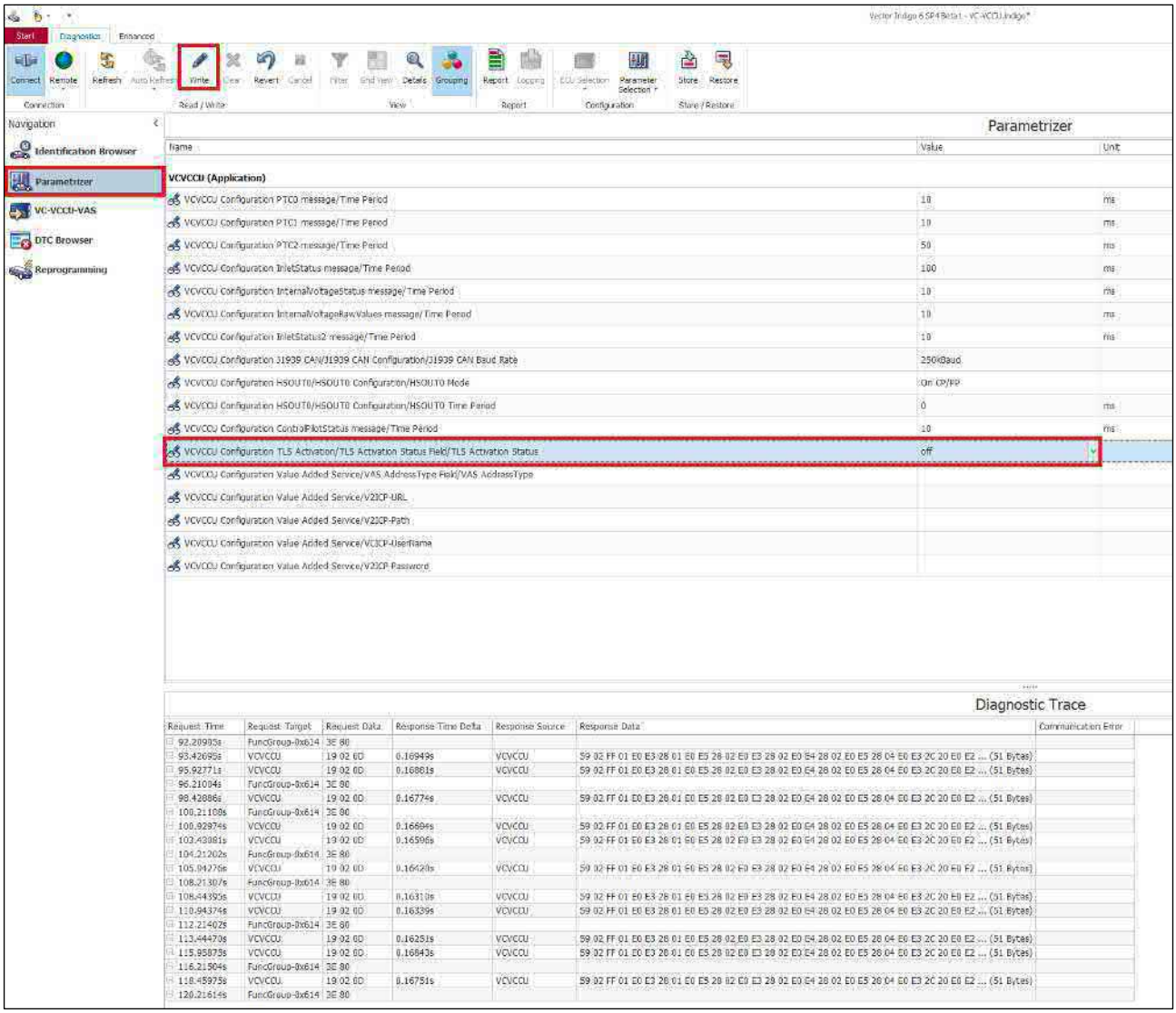
Configuration with Indigo

The configuration of TLS (V2G) can be executed with Indigo according to the following description.

1. Select the tab “VC-VCCU-VAS” and click on the empty data field of V2G. Select the requested TLS certificate and click on the button “Write” to execute the configuration. After the successful writing of the TLS certificate a notification shows up in the field “Information”.



2. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration TLS Activation/TLS Activation Status Field/TLS Activation Status”. Select the requested TLS Activation configuration and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session, e.g. every second. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Request Seed (Level 1):
XX: Seed (4 byte)
Request: 02 27 01 FF FF FF FF FF
Response: 06 67 01 XX XX XX XX FF

4. Send Key (Level 1):
XX: Key (4 byte)
Request: 06 27 02 XX XX XX XX FF
Response: 02 67 02 FF FF FF FF FF

The key can be calculated with the following algorithm and key constant:

- Key constant: 0xE3CA2342
- Algorithm: (((SEED * 0x6076DBAF) + 0x5397FB1) ^ ((~SEED * 0x72B6BF45) + 0xBC614E) ^ KEY_CONSTANT)

5. TLS Certificate (800 byte):
XX: Certificate (800 byte)
Request: 13 23 2E FD 0D XX XX XX
Response: 30 08 14 AA AA AA AA AA
Request: 21 XX XX XX XX XX XX XX
Request: 22 XX XX XX XX XX XX XX
...

Note
This description does not include all request/response-messages due to the size of the TLS certificate (800 byte). In order to write the TLS certificate correctly the transport protocol according to ISO 15765-2 [6] has to be implemented.

The following response indicates a successful writing of the TLS certificate.

Response: 03 6E FD 0D FF FF FF FF

6. TLS Activation:

XX:
- 0x00 --> Deactivate TLS
- 0x01 --> Activate TLS

Request: 04 2E FD 0C XX FF FF FF
Response: 03 6E FD 0C FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present TLS activation configuration, the following communication has to be executed.

7. Read TLS activation configuration:

Request: 03 22 FD 0C FF FF FF FF
Response: 04 62 FD 0C XX FF FF FF

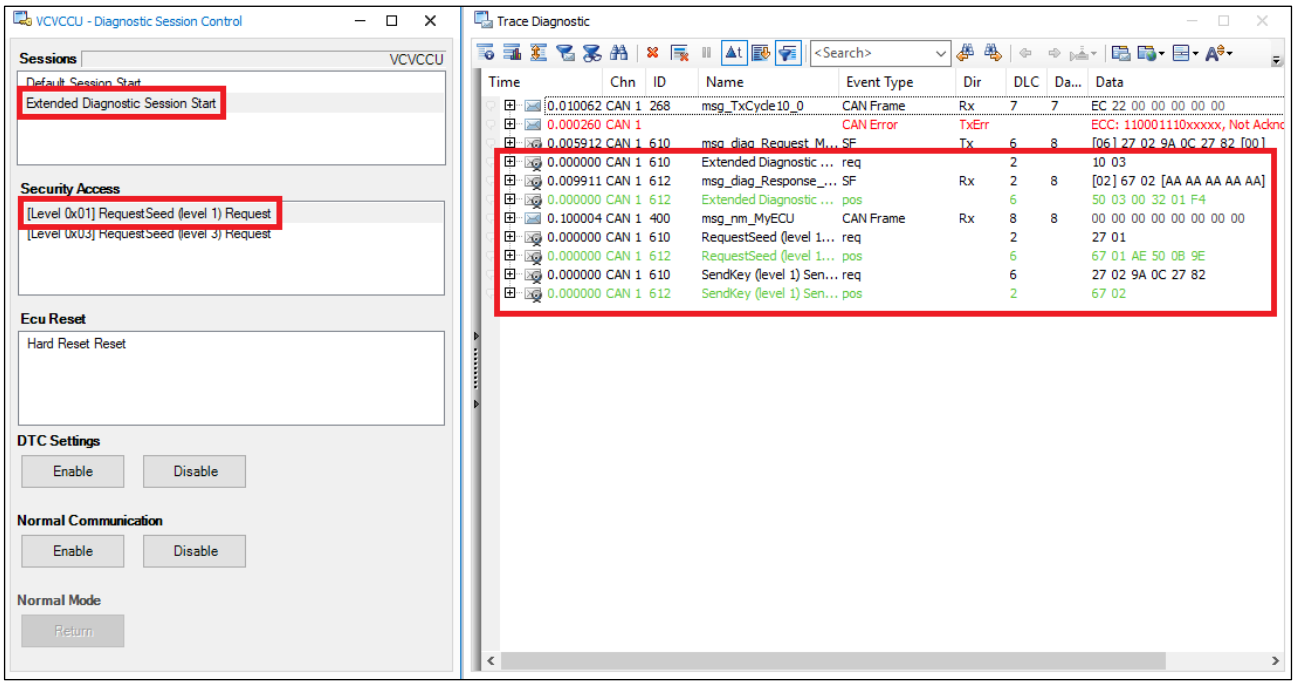
5.2.1.2.10 Configuration of Transport Layer Security – VAS

The VC-EVCC provides the possibility to establish a secure connection to the EVSE using Transport Layer Security (TLS) for Value Added Services.

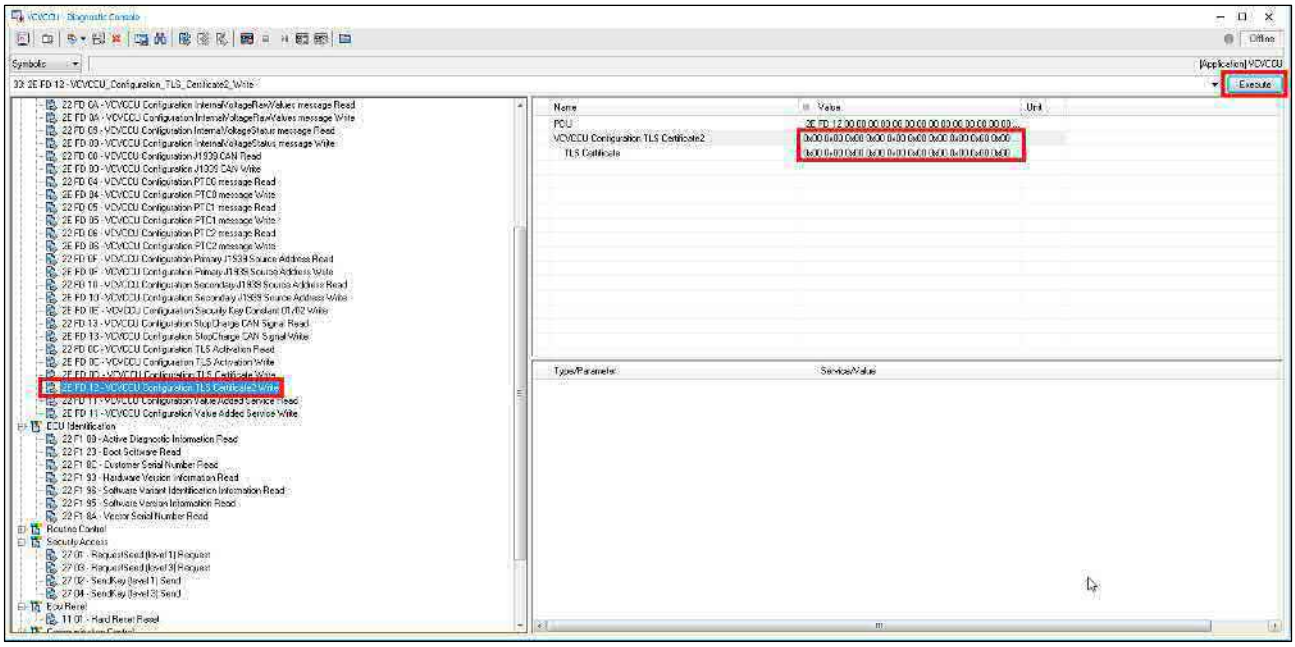
Configuration with CANoe/CANalyzer

The configuration of TLS (VAS) can be executed with CANoe/CANalyzer according to the following description.

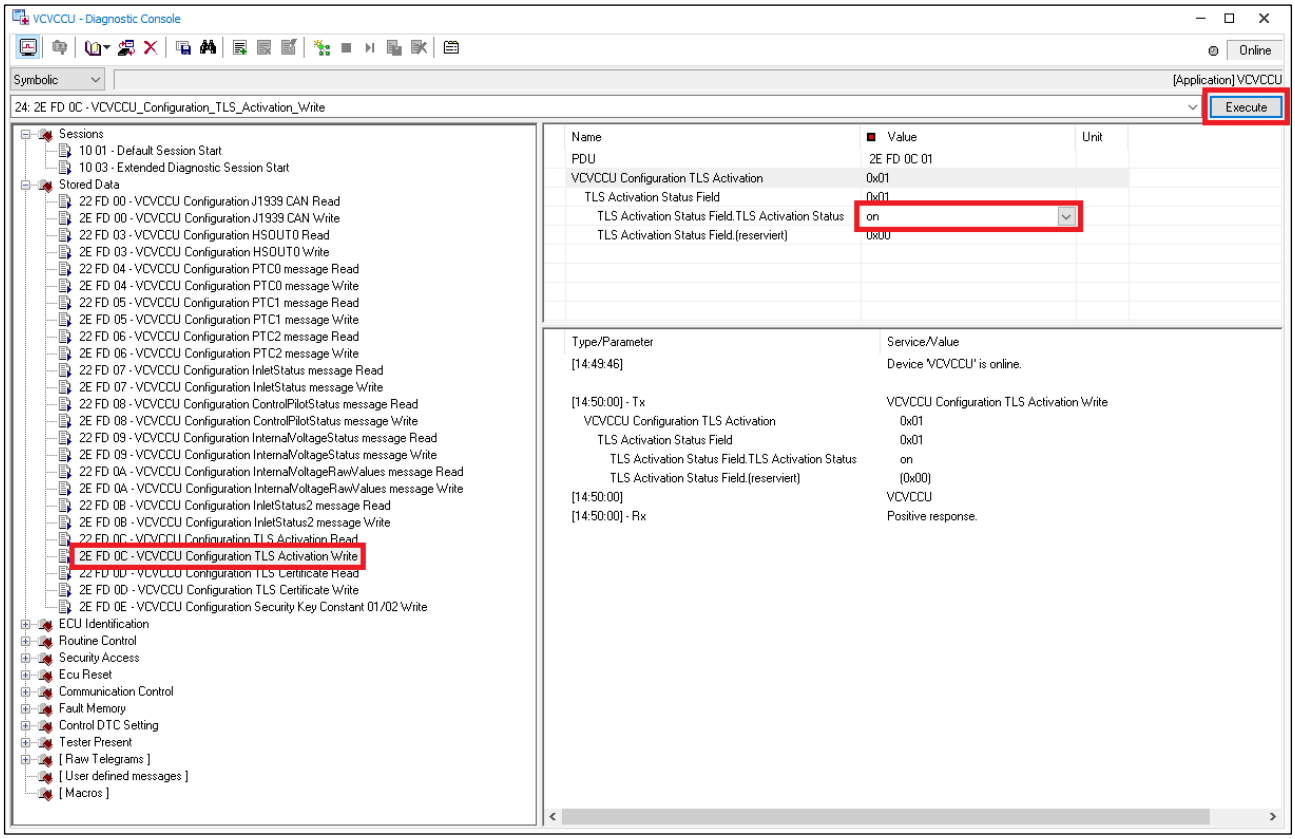
1. The configuration of TLS requires the diagnostic services “Extended Session” and “Security Access”. Therefore, select the window “VCVCCU – Diagnostic Session Control” and double-click on “Extended Session Start”. Continue by double-clicking on “[Level 0x01] Request Seed (level 1) Request”. Please note that the responses must be positive. The request and response messages are shown in the window “Trace Diagnostic”.



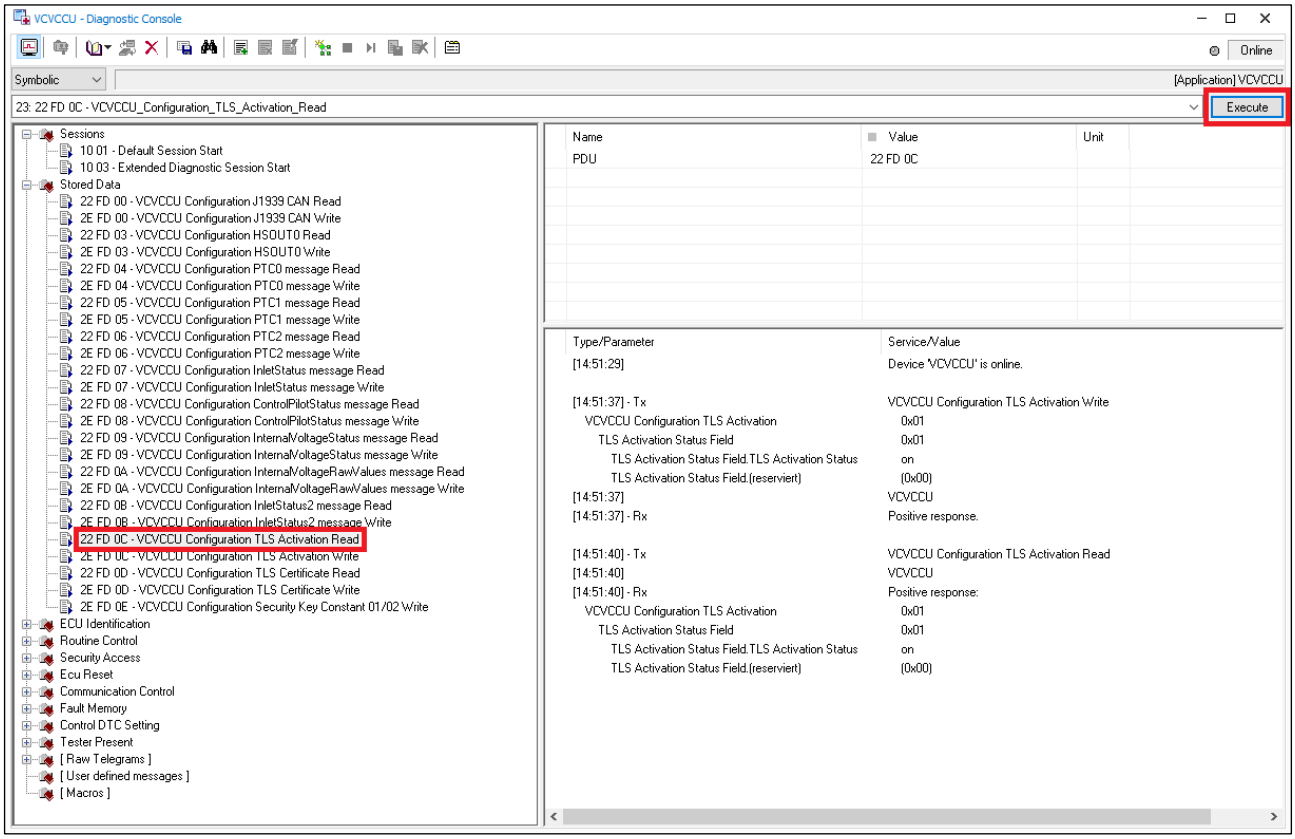
2. To use TLS a certificate must be written. Therefore, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 12 – VCVCCU Configuration TLS Certificate2 Write”. Write the requested certificate (800 bytes) and click on “Execute”. Please note that the response must be positive.



3. Select the tab “Stored Data” and click on “2E FD 0C – VCVCCU Configuration TLS Activation Write”. Please choose the status “on” (activate) and click on the button “Execute”. Please note that the response must be positive. Once status “off” (deactivate) is selected, the TLS Certificate is set to a default value.



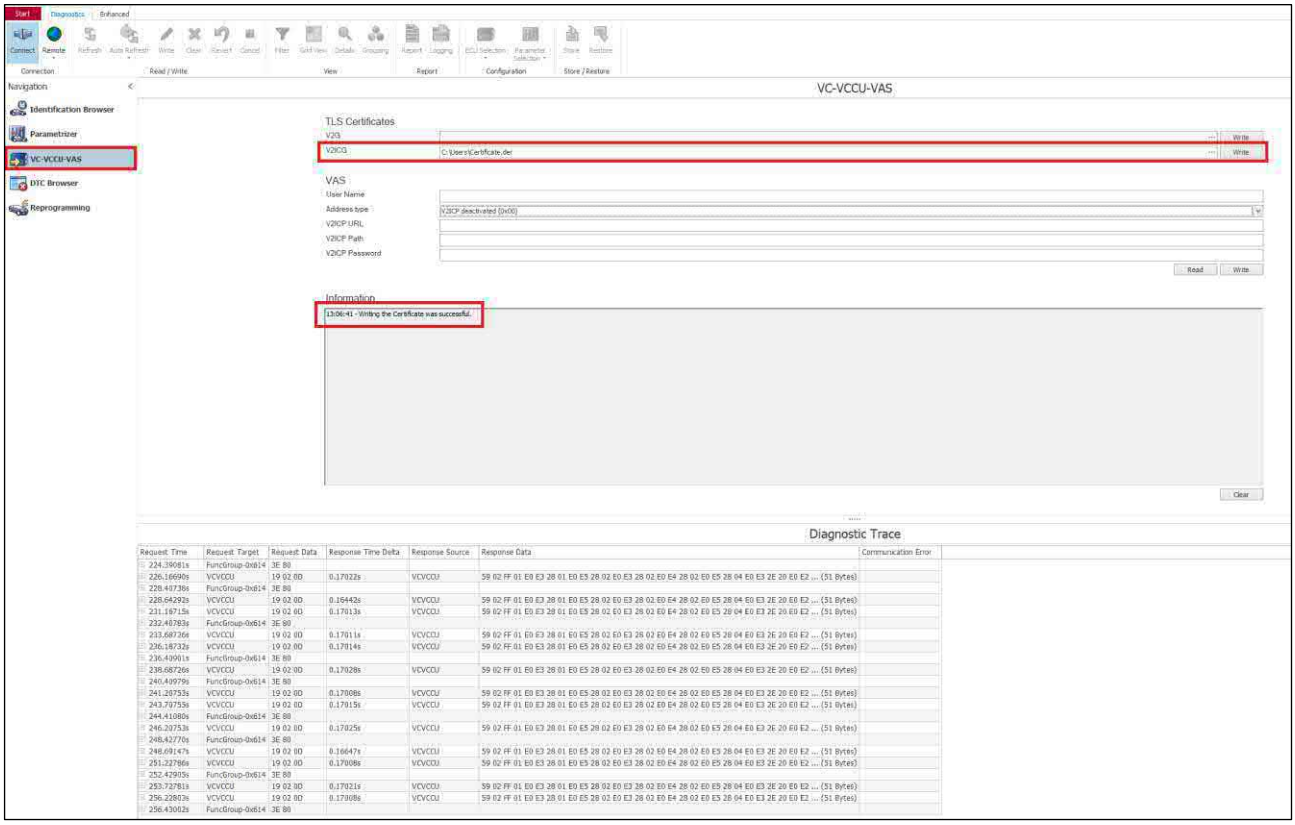
4. By executing the command “22 FD 0C – VCVCCU Configuration TLS Activation Read” the current configuration of TLS can be verified.



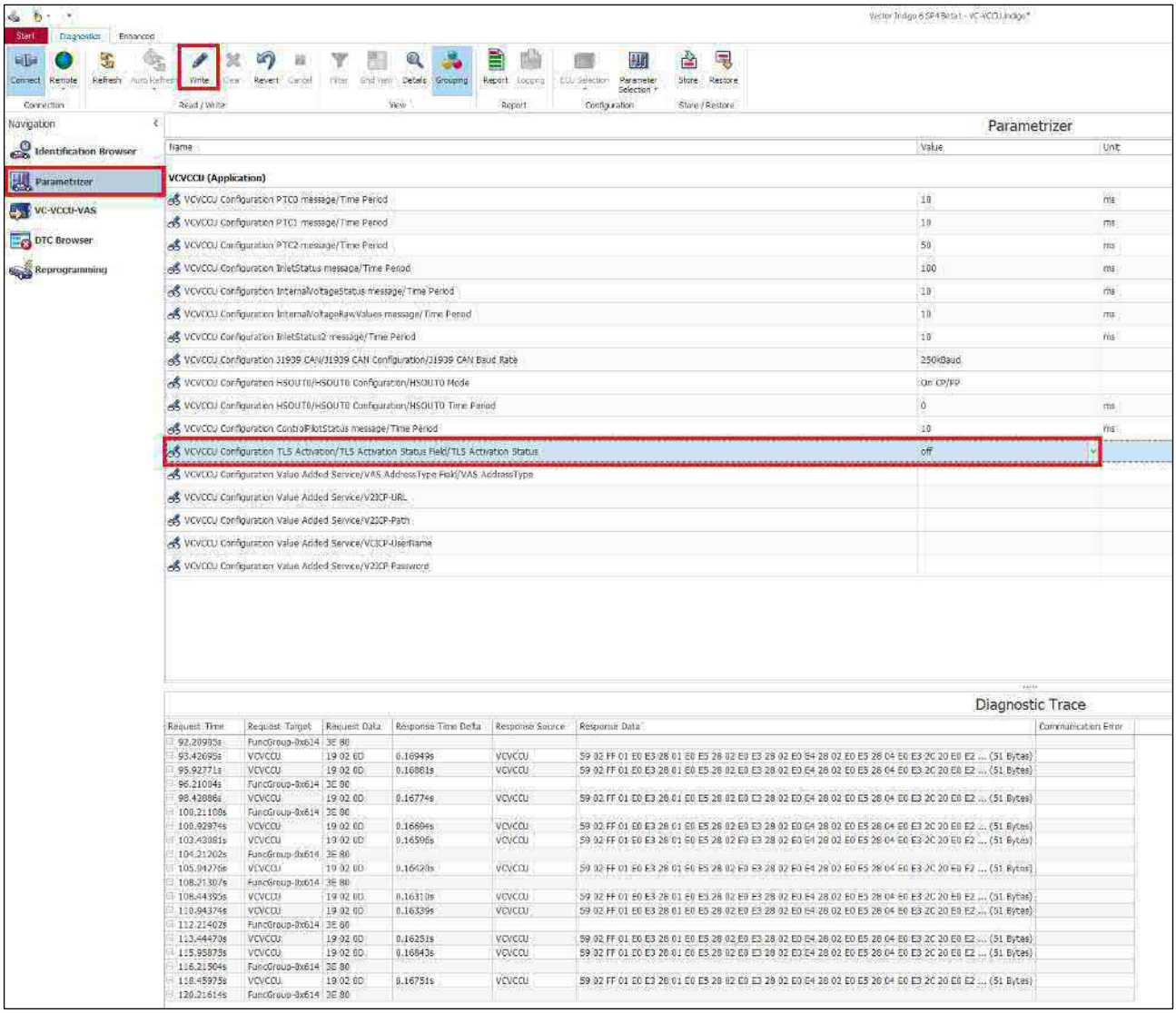
Configuration with Indigo

The configuration of TLS (VAS) can be executed with Indigo according to the following description.

1. Select the tab “VC-VCCU-VAS” and click on the empty data field of V2ICP. Select the requested TLS certificate and click on the button “Write” to execute the configuration. After the successful writing of the TLS certificate a notification shows up in the field “Information”.



2. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration TLS Activation/TLS Activation Status Field/TLS Activation Status”. Select the requested TLS Activation configuration and click on the button “Write” to execute the configuration.



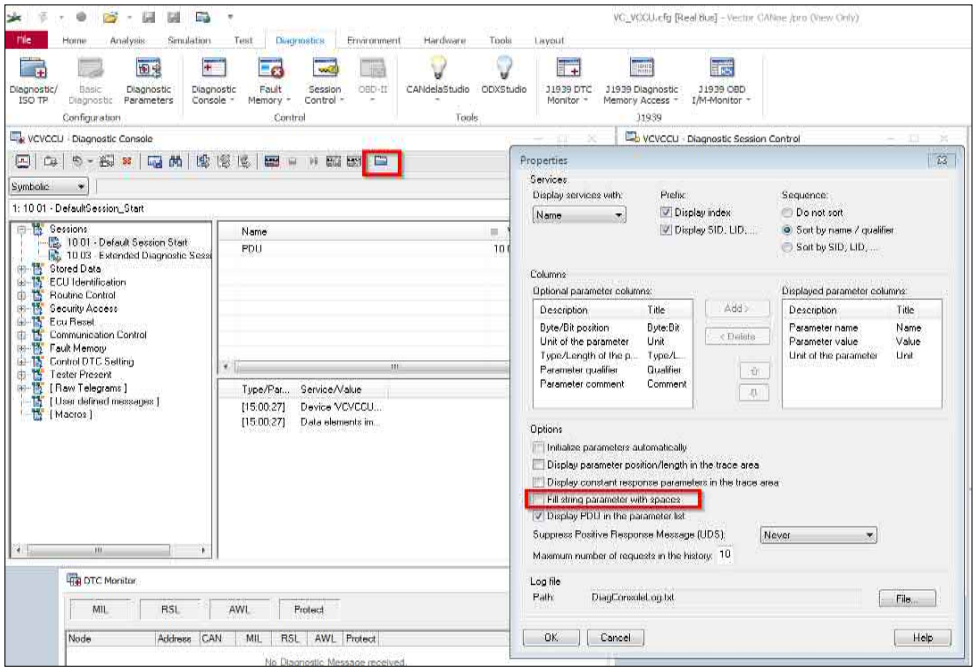
5.2.1.2.11 Configuration of Value Added Services

The VC-EVCC provides the usage of Value Added Service (VAS) according to the VDV 261 specification. In order to use Value Added Service TLS must be activated.

Configuration with CANoe/CANalyzer

The configuration of Value Added Services can be executed with CANoe/CANalyzer according to the following description.

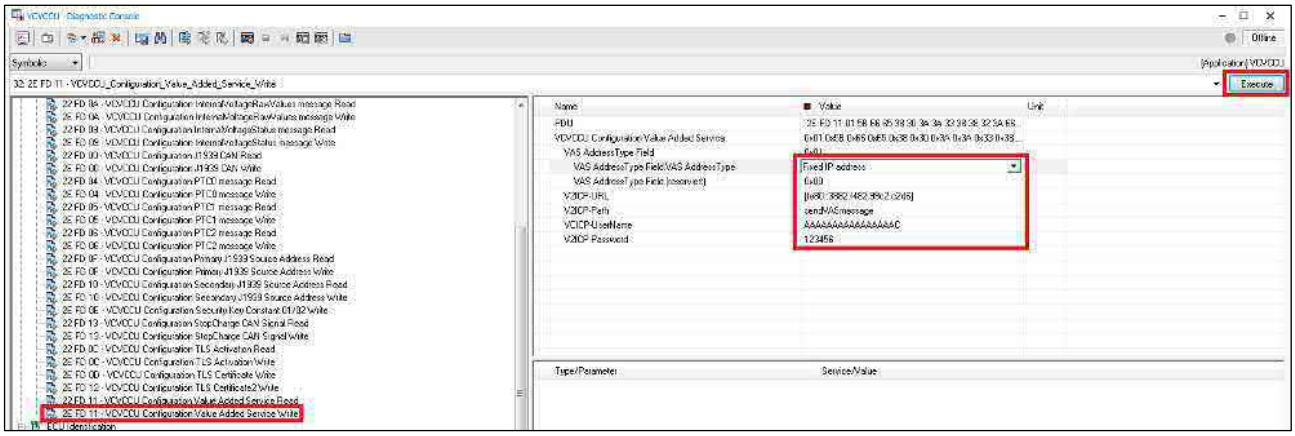
Caution
Before Value Added Service parameter configuration, make sure the option “Fill string parameter with spaces” is not checked.



Parameter	Description
VAS.AddressTypeField	> 0x00: V2ICP is deactivated (default) > 0x01: V2ICP is configured for fixed IPv6 address > 0x02: V2ICP is configured for URL based address
V2ICP-URL	URL Parameter of the URI > Option1: Fixed Ipv6 address in case of AddressTypeField 0x01 > Option2: URL address in case of AddressTypeField 0x02
V2ICP-Path	Path Parameter of the URI
V2ICP-Username	Username required for Basic Authentication (17 Bytes)
V2ICP-Password	Password required for Basic Authentication

> Option1: Fixed IP Address

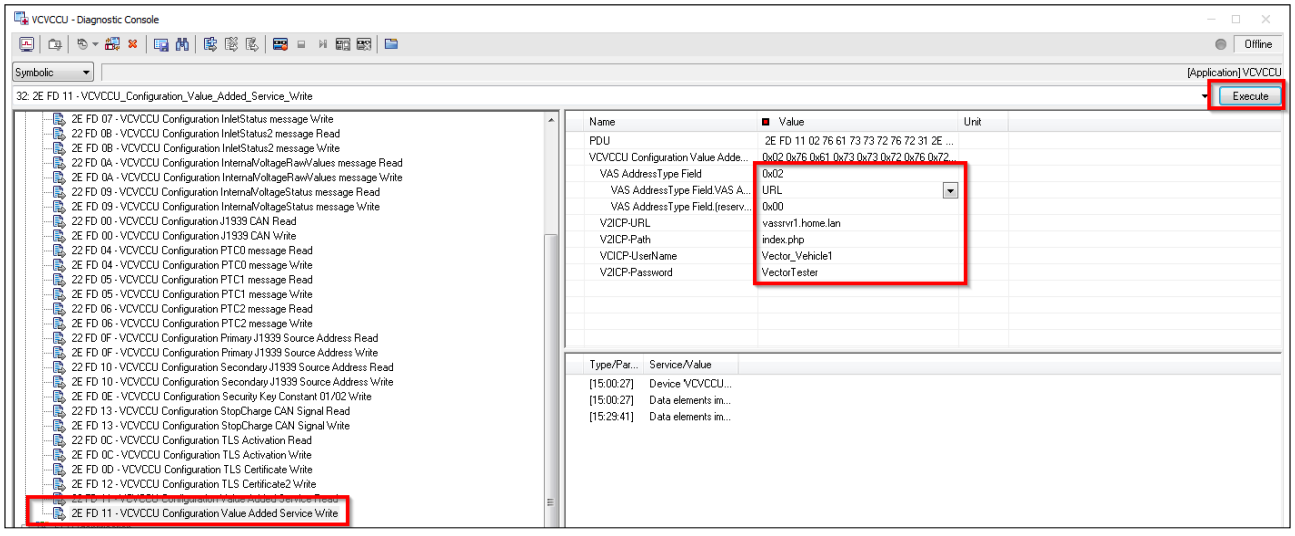
Select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 11 – VCVCCU Configuration Value Added Service Write”. Select the value “Fixed IP Address” for the field “VAS AddressType Field.VAD Address Type”. Then write the values of IPv6 Address, path, user name and password in the corresponding field. Click on “Execute” after all fields are filled out. Please note that the response must be positive.



Note
For Fixed IPv6 address (AddressType.Field:0x01), encode the IPv6 address in square brackets. Eg- [fe80::22]

> Option2: URL based Address

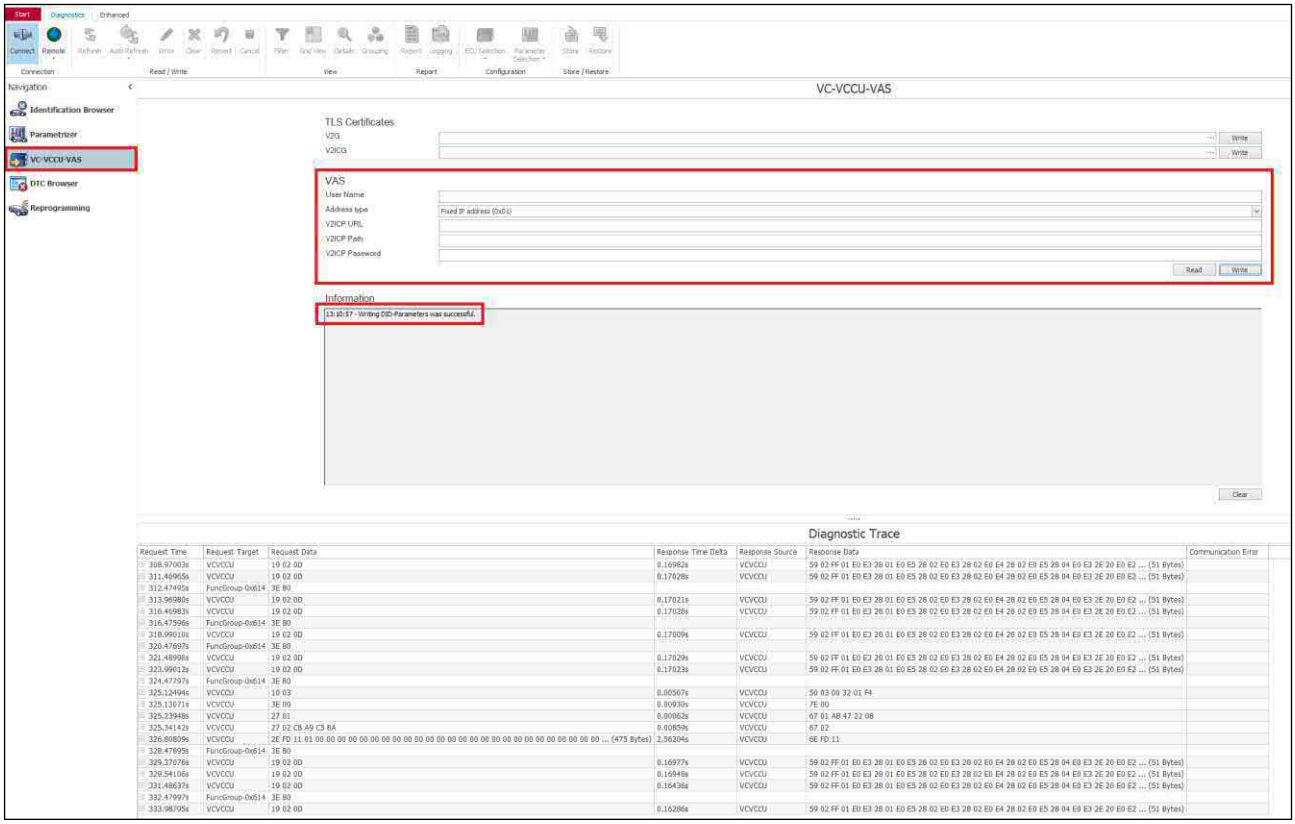
Select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 11 – VCVCCU Configuration Value Added Service Write”. Select the value “URL” for the field “VAS AddressType Field.VAS Address Type”. Then write the values of URL, path, user name and password in the corresponding field. Click on “Execute” after all fields are filled out. Please note that the response must be positive.



Configuration with Indigo

The configuration of TLS (V2G) can be executed with Indigo according to the following description.

1. Select the tab “VC-VCCU-VAS” and click on the data field “Address Type”. Select the requested Address Type configuration and enter the User Name, V2ICP URL, V2ICP Path and V2ICP Password. Click on the button “Write” to execute the configuration. After the successful writing of the TLS certificate a notification shows up in the field “Information”.



5.2.1.2.12 Configuration of Plug and Charge

The VC-EVCC provides the possibility to use Plug and Charge (PnC) according to ISO 15118. The following DIDs are used for the Plug and Charge configuration of the VC-EVCC.

PnC Activation:

- DID FD 26 – Configuration PnC Activation

PnC Certificates/Private Keys:

- DID FD 27 – Configuration OEM Provisioning Certificate
- DID FD 28 – Configuration OEM Provisioning Certificate Private Key
- DID FD 29 – Configuration OEM Provisioning Certificate and Private Key
- DID FD 2A – Configuration PnC Contract Certificate
- DID FD 2B – Configuration PnC Contract Certificate Private Key
- DID FD 2C – Configuration PnC Contract Certificate and Private Key
- DID FD 2D – Configuration PnC Sub Certificate
- DID FD 2F – Configuration PnC Root Certificate

5.2.1.2.12.1 Configuration of Plug and Charge Activation/Deactivation

Plug and Charge can be activated via UDS as described in this chapter.

The service structure is defined as 1 byte.

Value	Description
0x00	Plug and Charge is deactivated (default)
0x01	Plug and Charge is activated

Note

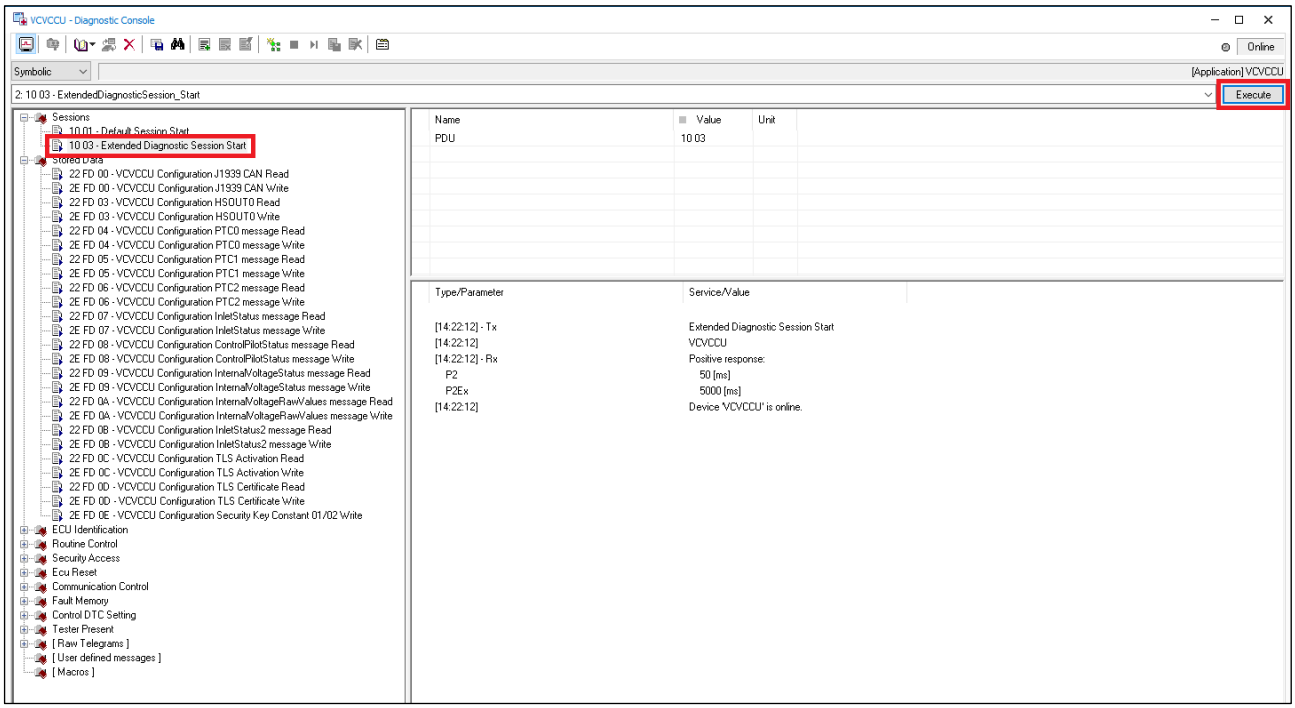
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

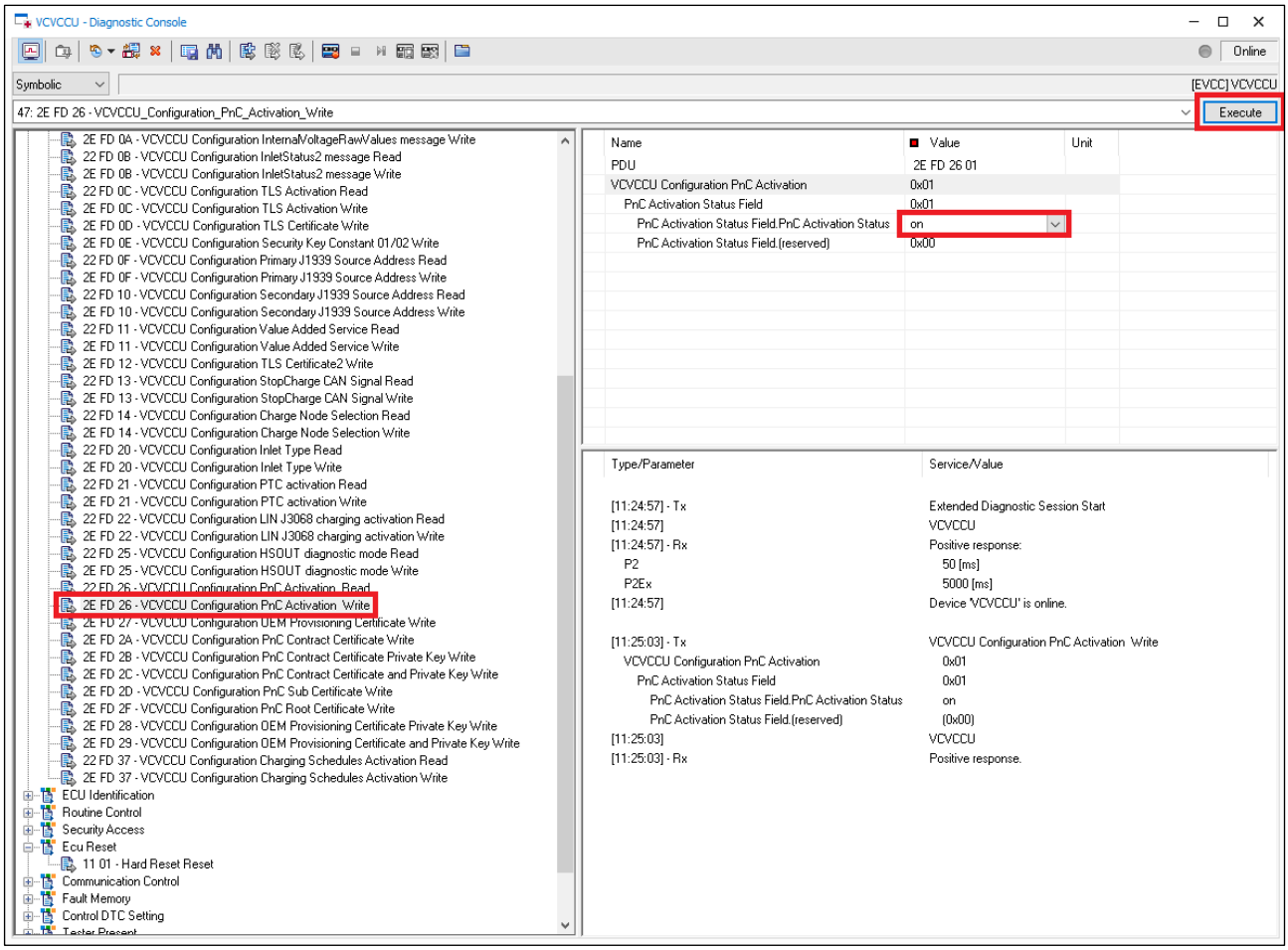
Configuration with CANoe/CANalyzer

The configuration of Plug and Charge can be executed with CANoe/CANalyzer according to the following description.

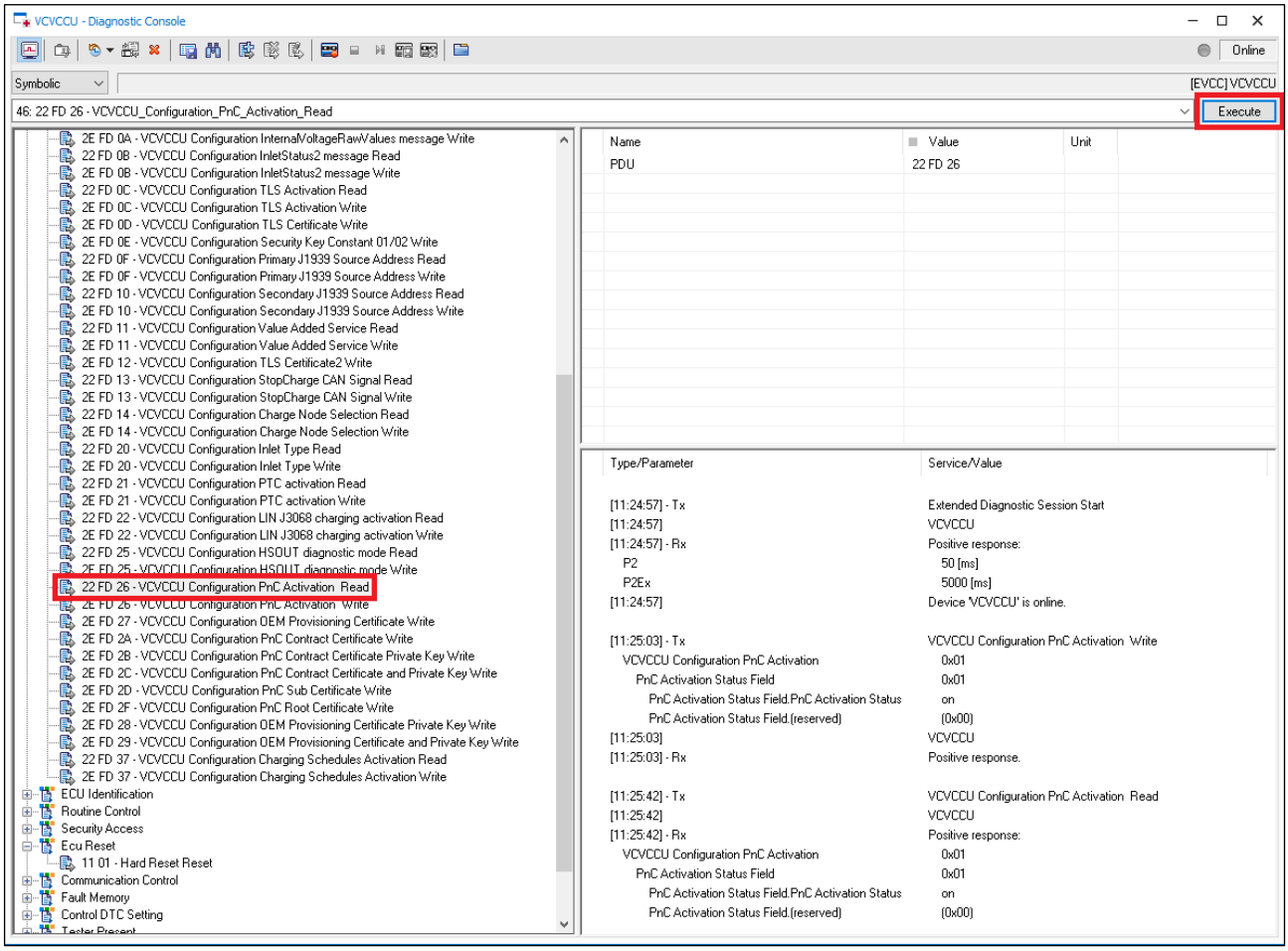
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 26 – VCVCCU Configuration PnC Activation Write”. Please choose the requested Plug and Charge configuration (“on” or “off”) and click on the button “Execute”. Please note that the response must be positive.



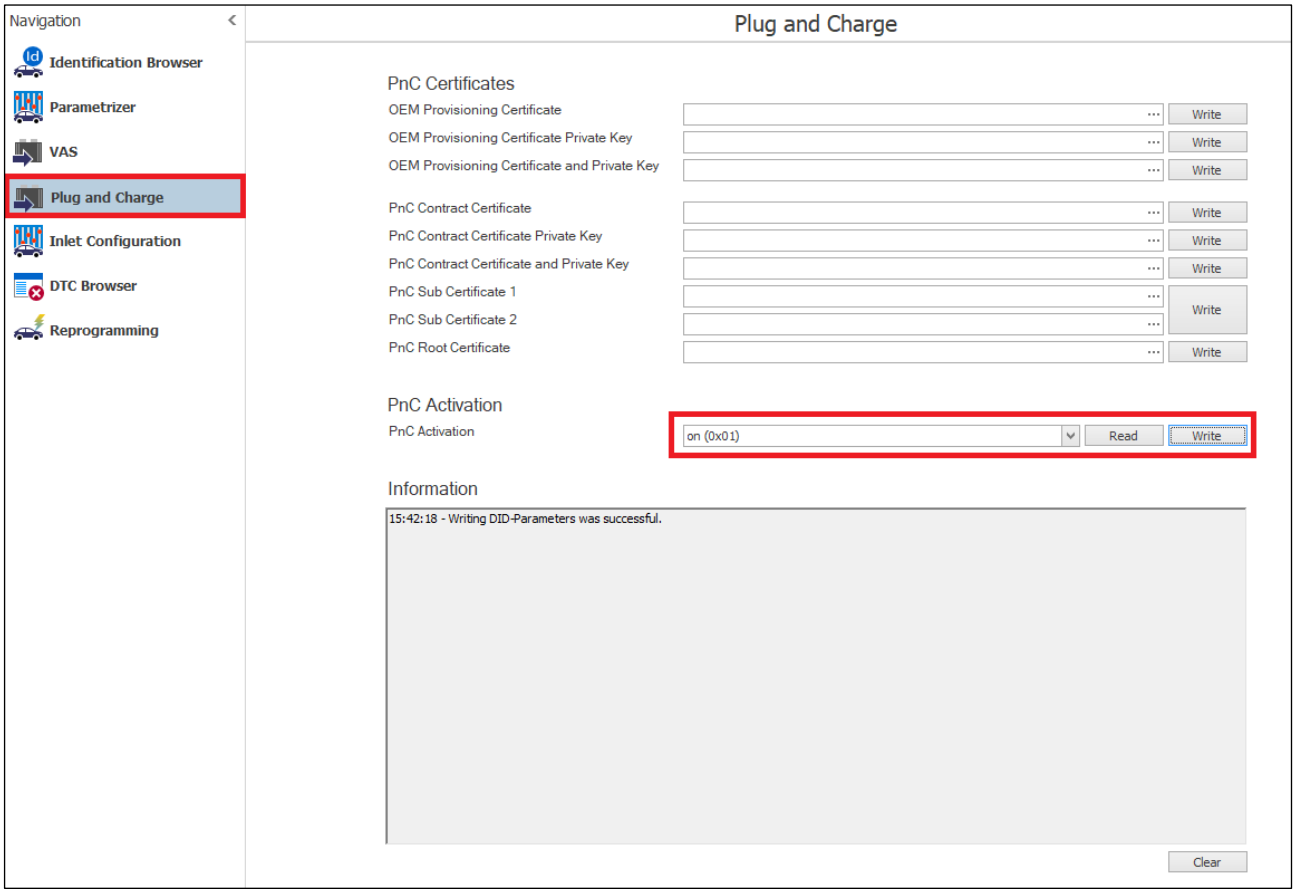
3. By executing the command “22 FD 26 – VCVCCU Configuration PnC Activation Read” the current configuration of Plug and Charge can be verified.



Configuration with Indigo

The configuration of Plug and Charge can be executed with Indigo according to the following description.

1. Select the tab “Plug and Charge” and choose the requested Plug and Charge configuration (“on” or “off”) and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Plug and Charge:
XX:
- 0x00: Plug and Charge is deactivated
- 0x01: Plug and Charge is activated

Request: 04 2E FD 26 XX FF FF FF
Response: 03 6E FD 26 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present configuration of Plug and Charge, the following communication has to be executed.

4. Read Plug and Charge configuration:
Request: 03 22 FD 26 FF FF FF FF
Response: 04 62 FD 26 XX FF FF FF

5.2.1.2.12.2 Configuration of PnC Certificates/Private Keys

The certificates and private keys for Plug and Charge can be configured via UDS as described in this chapter.

Caution
The stated lengths of certificates and private keys must be observed. If a certificate or a private key is shorter than the stated length the remaining bytes must be filled with zeros.

OEM Provisioning Certificate/Private Key:

The OEM provisioning certificate and the associated private key can be configured separately in two steps (FD 27/ FD 28) or together in one step (FD 29).

- DID FD 27 – Configuration OEM Provisioning Certificate (800 Bytes)
- DID FD 28 – Configuration OEM Provisioning Certificate Private Key (32 Bytes)
- DID FD 29 – Configuration OEM Provisioning Certificate and Private Key (832 Bytes)
  - Byte 0…799: Certificate byte array
  - Byte 800…831: Private Key byte array

PnC Contract Certificate/Private Key:

The PnC contract certificate and the associated private key can be configured separately in two steps (FD 2A/ FD 2B) or together in one step (FD 2C).

- DID FD 2A – Configuration PnC Contract Certificate (800 Bytes)
- DID FD 2B – Configuration PnC Contract Certificate Private Key (32 Bytes)
- DID FD 2C – Configuration PnC Contract Certificate and Private Key (832 Bytes)
  - Byte 0…799: Certificate byte array
  - Byte 800…831: Private Key byte array

PnC Sub Certificate:

- DID FD 2D – Configuration PnC Sub Certificate (1600 Bytes)
  - Byte 0…799: Sub Certificate 1 (Distance to root 0) byte array
  - Byte 800…1599: Sub Certificate 2 (Distance to root 1) byte array

Note
If only one sub certificate is used, the byte arrays of the second sub certificates shall be filled with zeros.

PnC Root Certificate

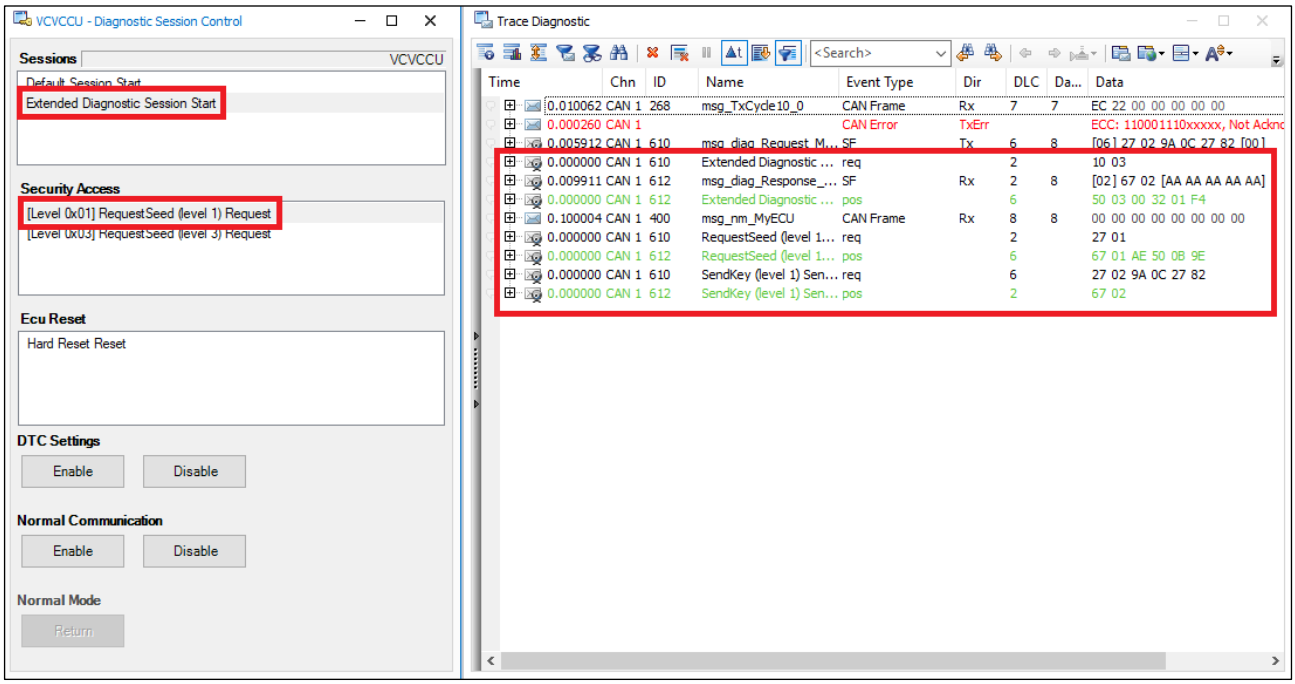
- DID FD 2F – Configuration PnC Root Certificate (800 Bytes)

Configuration with CANoe/CANalyzer

The configuration of PnC certificates and private keys can be executed with CANoe/CANalyzer according to the following description.

Note
An update of the parameter requires a reboot of the VC-EVCC to be applicable.
The diagnostic service “Write Data By Identifier” is only available in the application extended session.

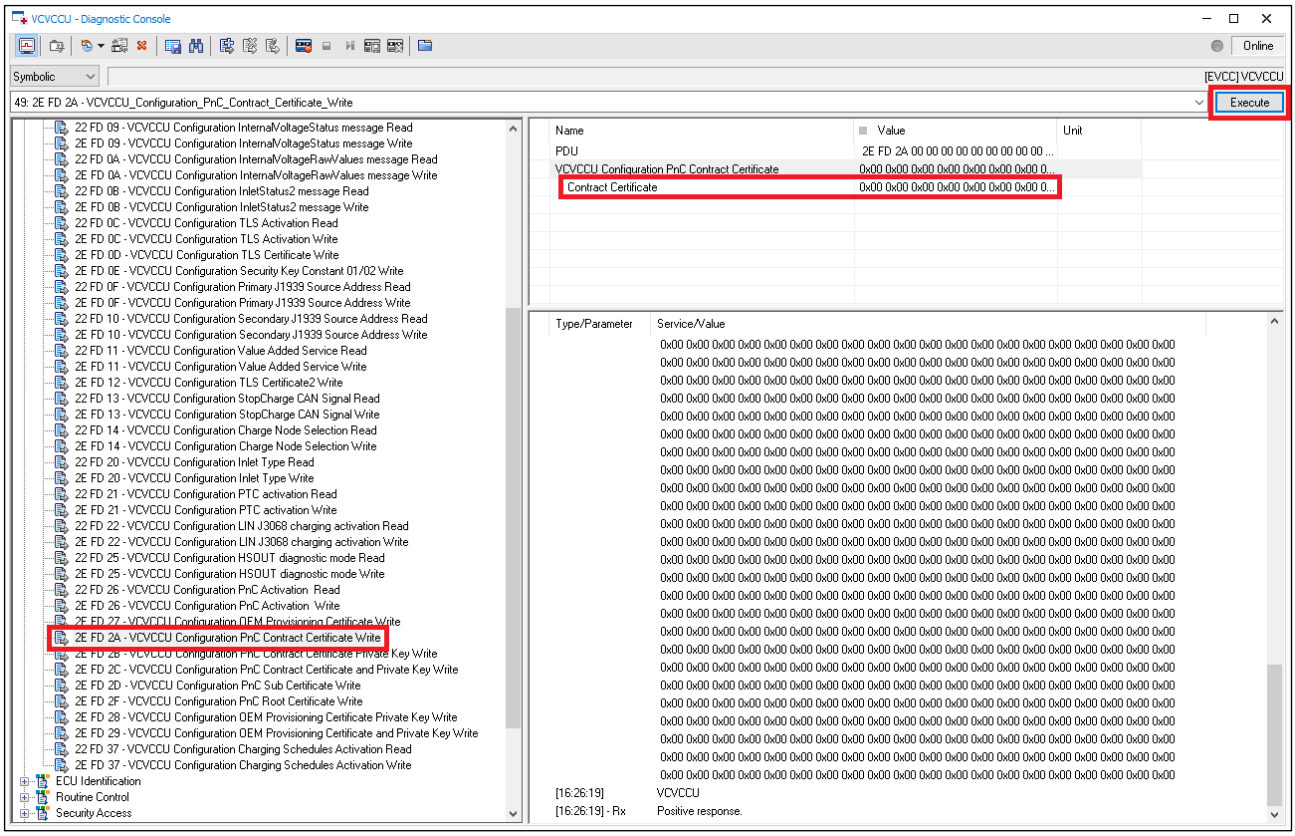
1. The configuration of PnC certificates and private keys requires the diagnostic services “Extended Session” and “Security Access”. Therefore, select the window “VCVCCU – Diagnostic Session Control” and double-click on “Extended Session Start”. Continue by double-clicking on “[Level 0x01] Request Seed (level 1) Request”. Please note that the responses must be positive. The request and response messages are shown in the window “Trace Diagnostic”.



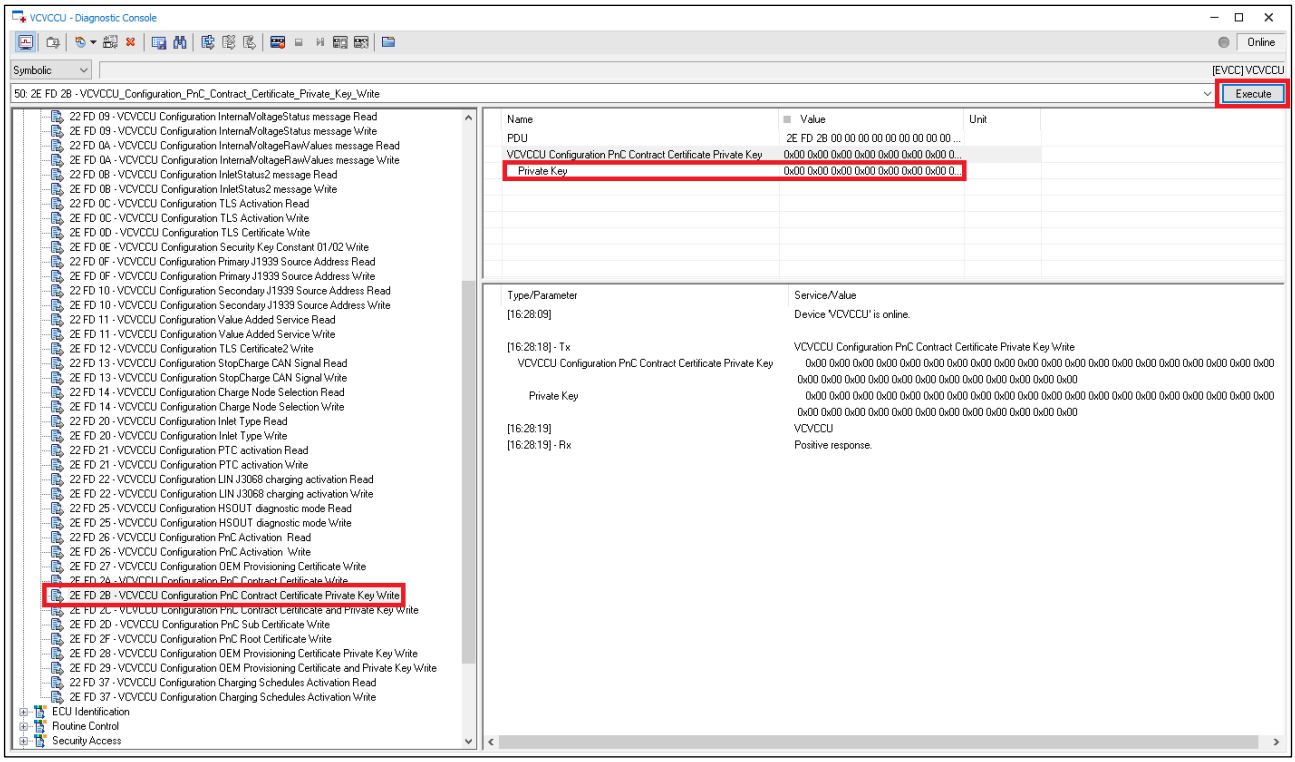
2. As soon as the extended session is active and the security access has been performed successfully, the configuration of certificates and private keys can be started according to the following description.

Configuration of PnC Contract Certificate/Private Key:

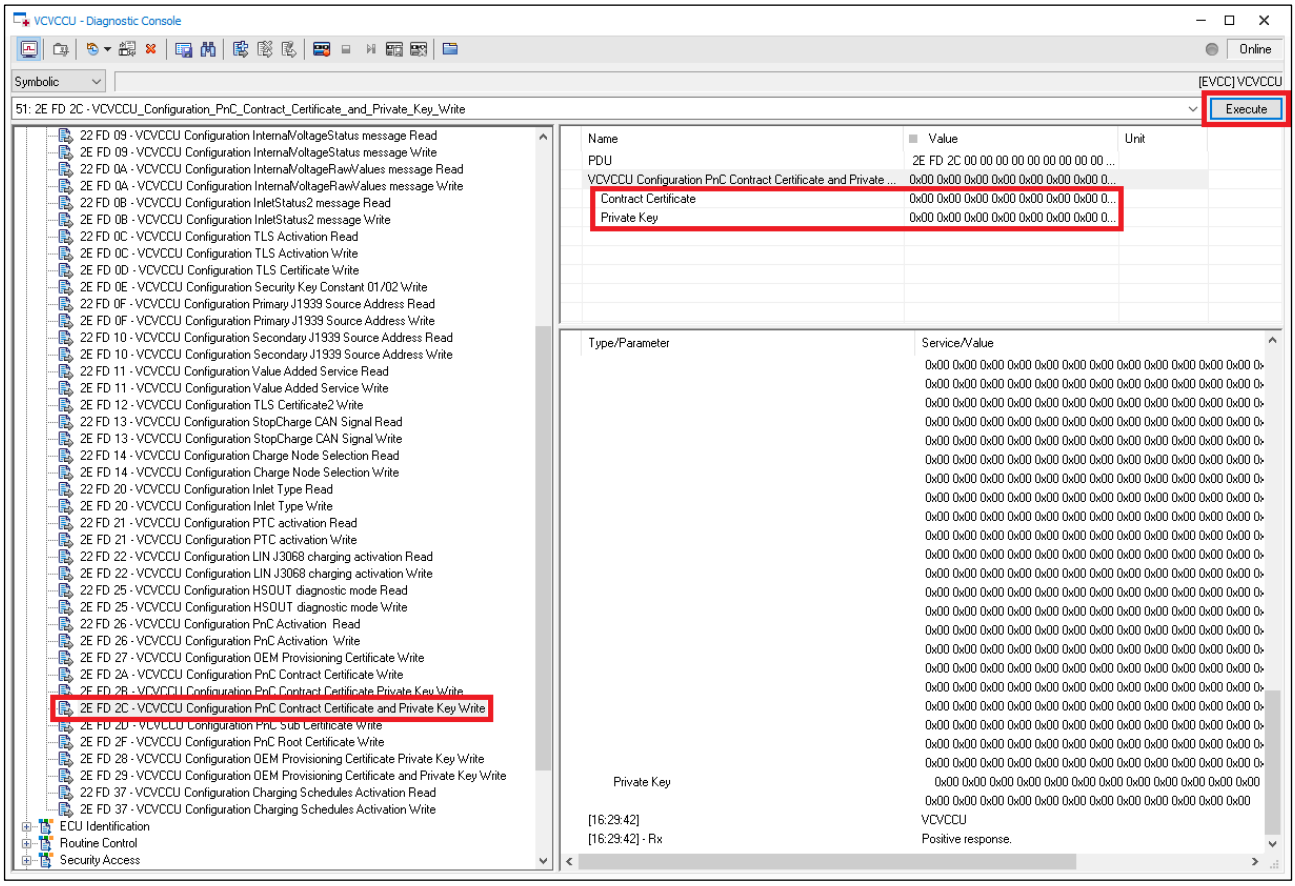
In order to configure the PnC contract certificate, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 2A – VCVCCU Configuration PnC Contract Certificate Write”. Write the requested certificate (800 bytes) and click on “Execute”. Please note that the response must be positive.



In order to configure the PnC contract certificate's private key, select the window "VCVCCU – Diagnostic Console" and select the tab "Stored Data". Click on "2E FD 2B – VCVCCU Configuration PnC Contract Certificate Private Key Write". Write the requested private key (32 bytes) and click on "Execute". Please note that the response must be positive.



In order to configure the PnC contract certificate and the associated private key in one step, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 2C – VCVCCU Configuration PnC Contract Certificate and Private Key Write”. Write the requested certificate and private key (832 bytes) and click on “Execute”. Please note that the response must be positive.



Configuration of OEM Provisioning Certificate/Private Key:

The configuration of the OEM provisioning certificate and the associated private key follows the same approach as the configuration of the contract certificate and its private key.

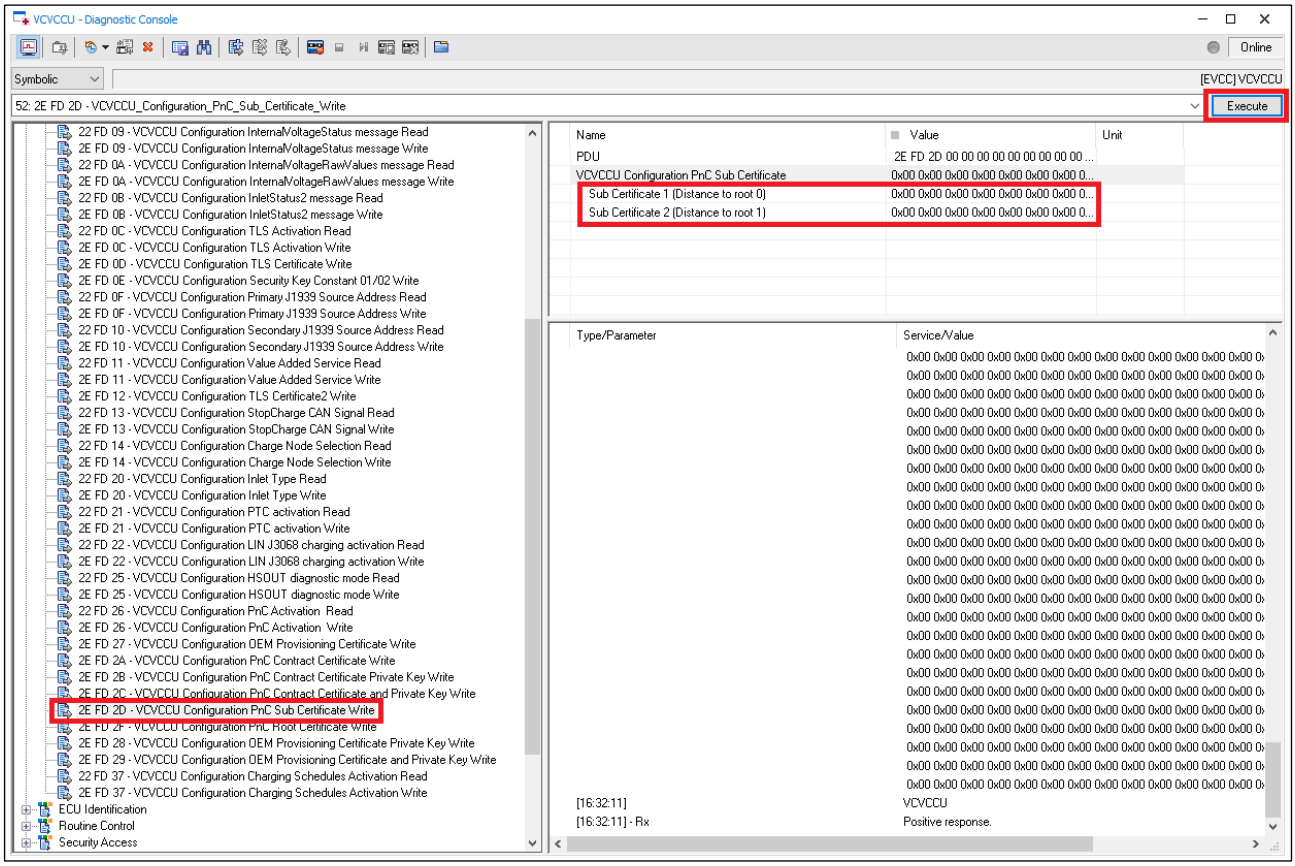
In order to configure the OEM provisioning certificate, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 27 – VCVCCU Configuration OEM Provisioning Certificate Write”. Write the requested certificate (800 bytes) and click on “Execute”. Please note that the response must be positive.

In order to configure the OEM provisioning certificate’s private key, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 28 – VCVCCU Configuration OEM Provisioning Certificate Private Key Write”. Write the requested private key (32 bytes) and click on “Execute”. Please note that the response must be positive.

In order to configure the OEM provisioning certificate and the associated private key in one step, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 29 – VCVCCU Configuration OEM Provisioning Certificate and Private Key Write”. Write the requested certificate and private key (832 bytes) and click on “Execute”. Please note that the response must be positive.

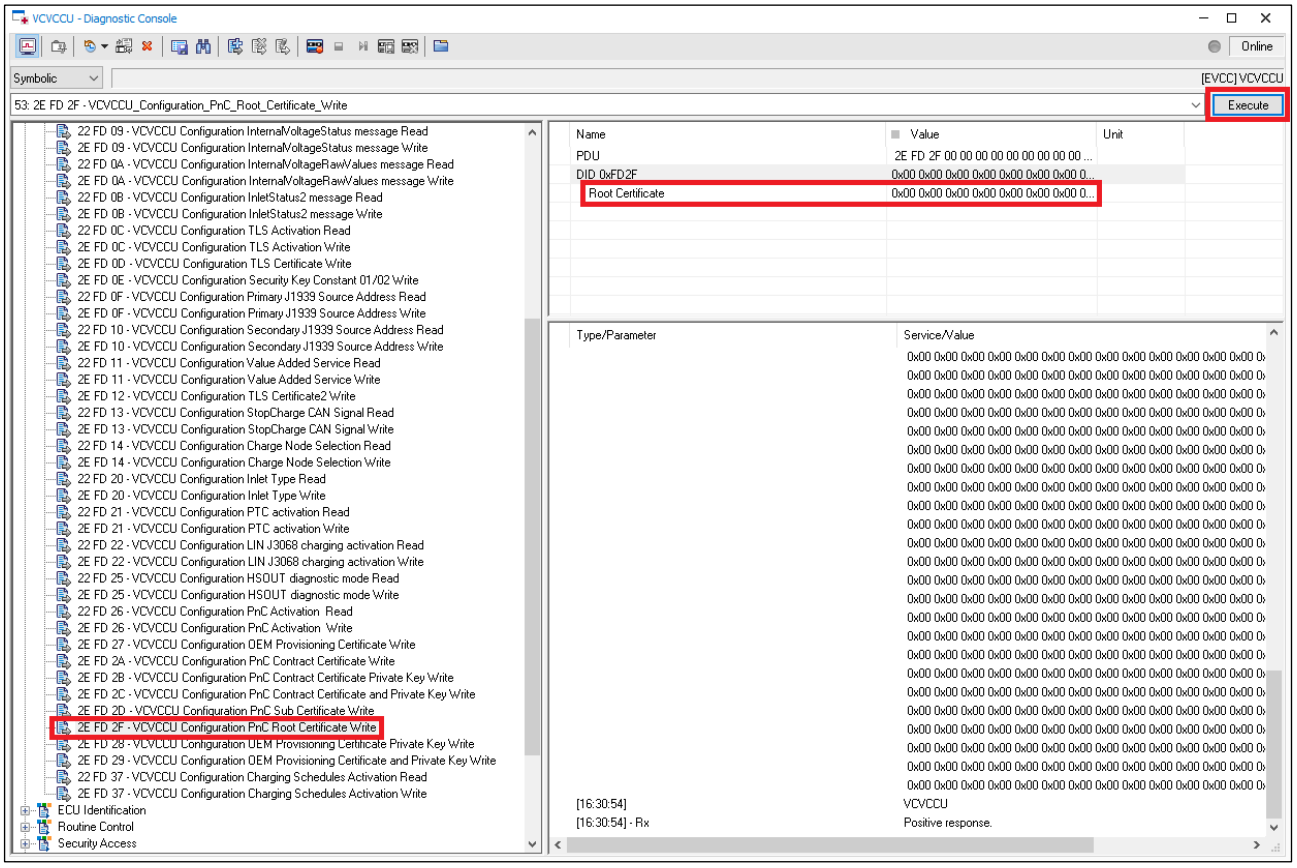
Configuration of PnC Sub Certificates:

In order to configure the PnC sub certificates, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 2D – VCVCCU Configuration PnC Sub Certificate Write”. Write the requested sub certificates (1600 bytes) and click on “Execute”. Please note that the response must be positive.



Configuration of PnC Root Certificate:

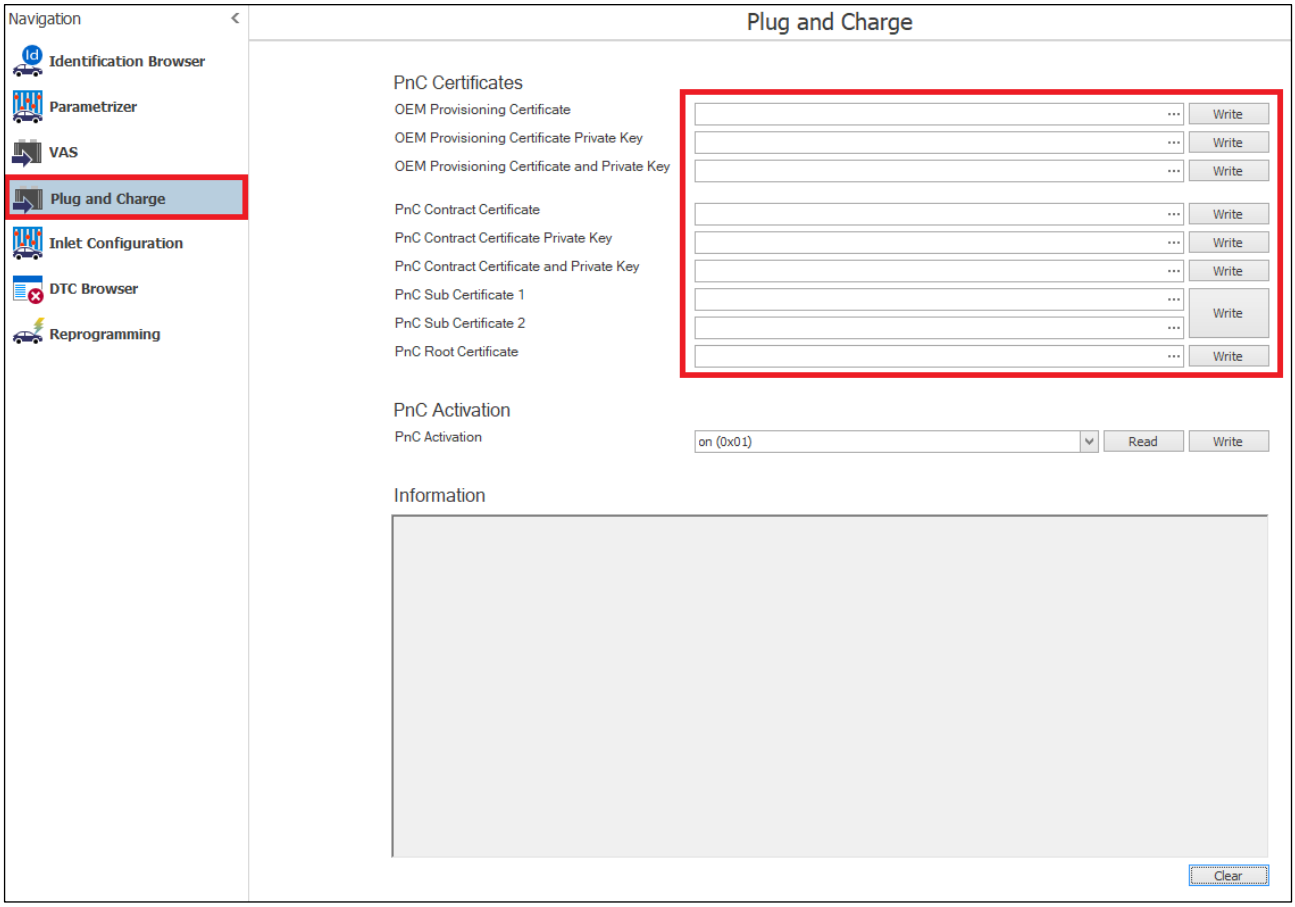
In order to configure the PnC root certificate, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 2F – VCVCCU Configuration PnC Root Certificate Write”. Write the requested root certificate (800 bytes) and click on “Execute”. Please note that the response must be positive.



Configuration with Indigo

The configuration of certificates and private keys for Plug and Charge can be executed with Indigo according to the following description.

1. Select the tab “Plug and Charge” and select the requested certificate/private key that shall be written. Click on the button “Write” to execute the configuration. After the successful writing of the certificate/private key a notification shows up in the field “Information”.



5.2.1.2.12.3 Routine Controls for PnC Certificates/Private Keys

The VC-EVCC provides several routine controls for Plug and Charge certificates/private keys. The following routine controls are available in order to validate or compare PnC certificates.

Caution
The execution of routine controls requires the diagnostic services “Extended Session” and “Security Access”. Otherwise, the VC-EVCC will send a negative response code.

Validation of PnC certificates/signature chain:

- RID 0xF002 – Validate OEM Provisioning Certificate
- RID 0xF003 – Validate Contract Certificate

The VC-EVCC validates the OEM Provisioning Certificate or the Contract Certificate against the respective stored private key. The validation result is either valid or invalid.

- RID 0xF008 – Validate Contract Certificate Signature Chain

The Contract Certificate Signature Chain is validated by the VC-EVCC with the reference time value provided in the diagnostic request message. The validation result is either “Valid” or “Invalid”.

Value	Description
0x00	Valid
0x01	Invalid

Table 5-9: Validation Result of PnC Certificates/Signature Chain

Comparison of PnC certificates:

- RID 0xF004 – Compare Contract Certificate
- RID 0xF005 – Compare OEM Provisioning Certificate
- RID 0xF006 – Compare Sub Certificate
- RID 0xF007 – Compare PnC Root Certificate

The VC-EVCC compares the installed certificate with the certificate provided in the diagnostic request message. The result is either “NonIdentical” or “Identical”. If the Sub Certificate shall be compared the distance to root (0 or 1) has to be provided in addition to the certificate.

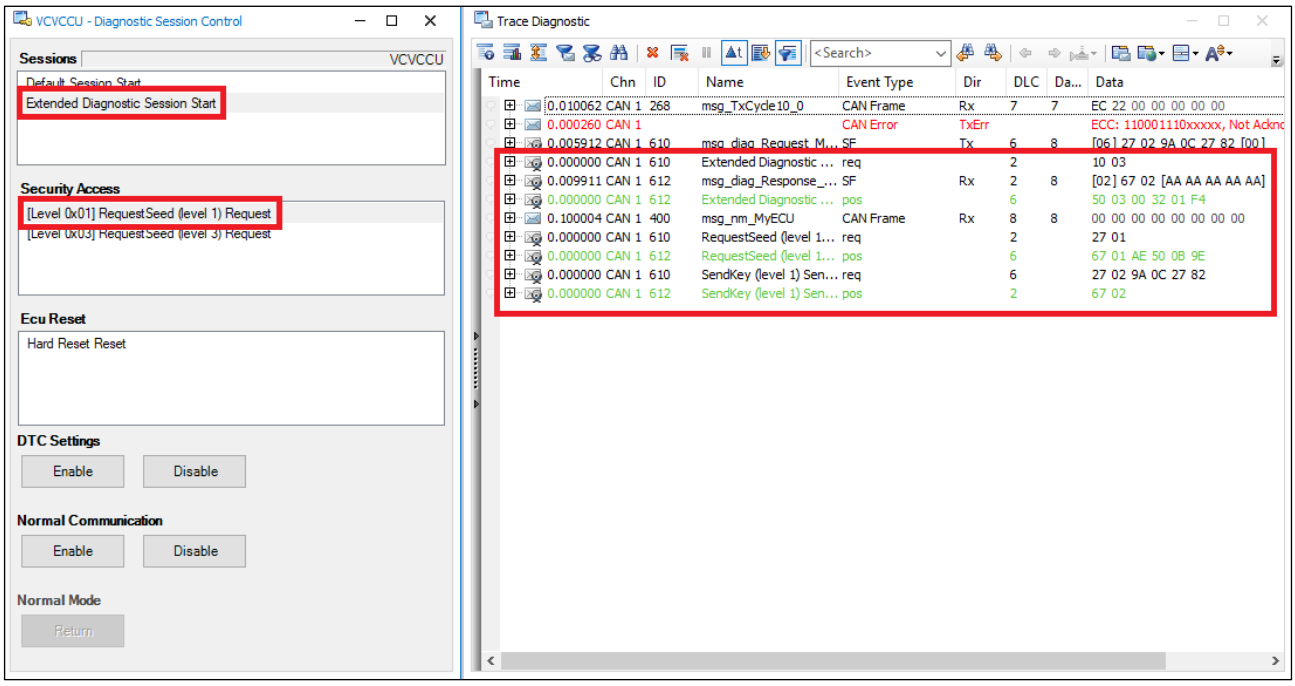
Value	Description
0x00	NonIdentical
0x01	Identical

Table 5-10: Result of Comparison Between PnC Certificates

Routine Controls with CANoe/CANalyzer

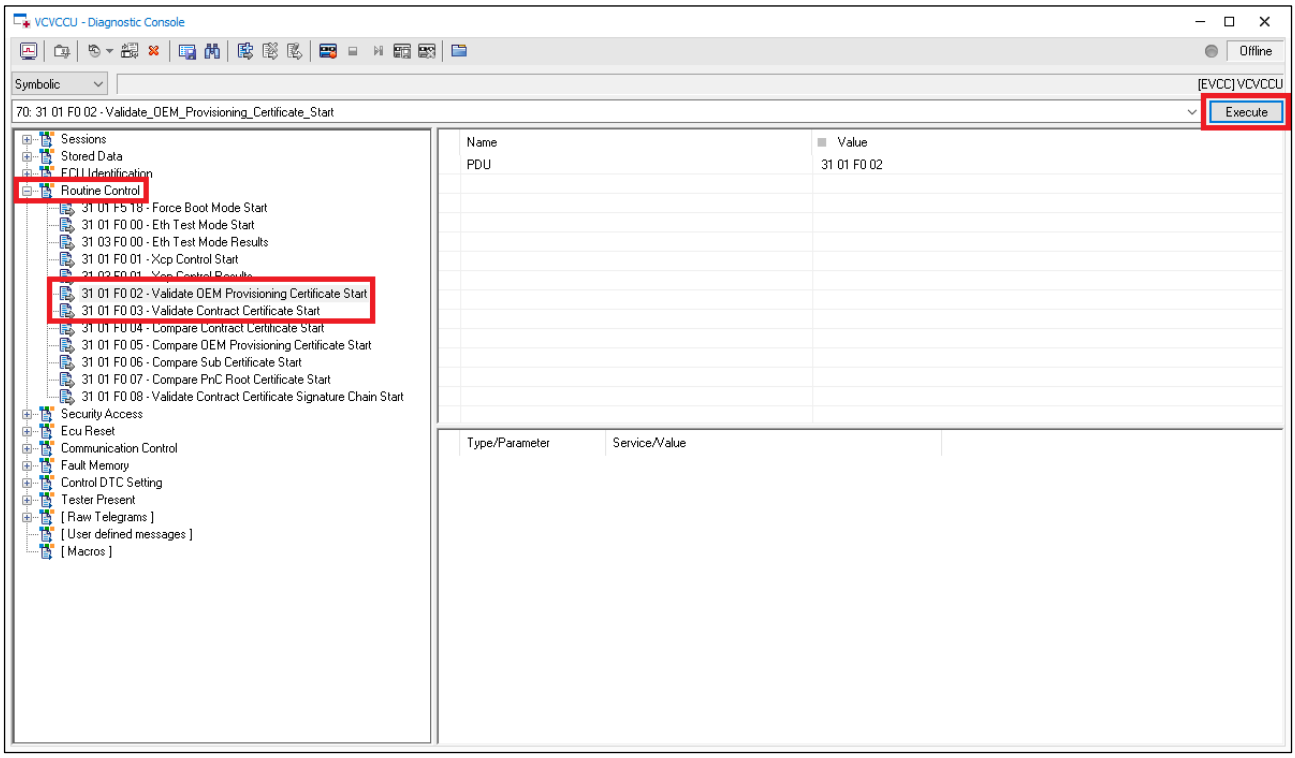
The routine controls of PnC certificates and private keys can be executed with CANoe/CANalyzer according to the following description.

1. The routine controls of PnC certificates and private keys require the diagnostic services “Extended Session” and “Security Access”. Therefore, select the window “VCVCCU – Diagnostic Session Control” and double-click on “Extended Session Start”. Continue by double-clicking on “[Level 0x01] Request Seed (level 1) Request”. Please note that the responses must be positive. The request and response messages are shown in the window “Trace Diagnostic”.

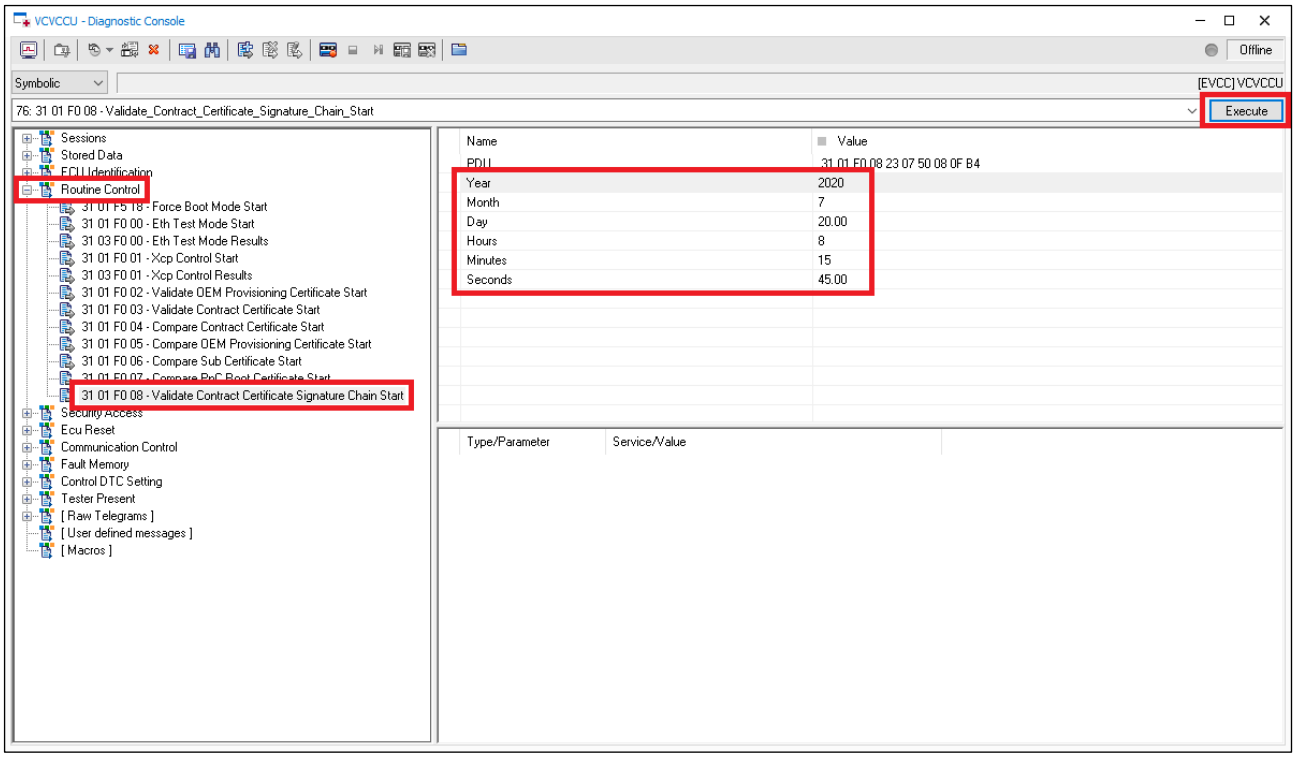


2. As soon as the extended session is active and the security access has been performed successfully, the routine controls of certificates and private keys can be started according to the following description.

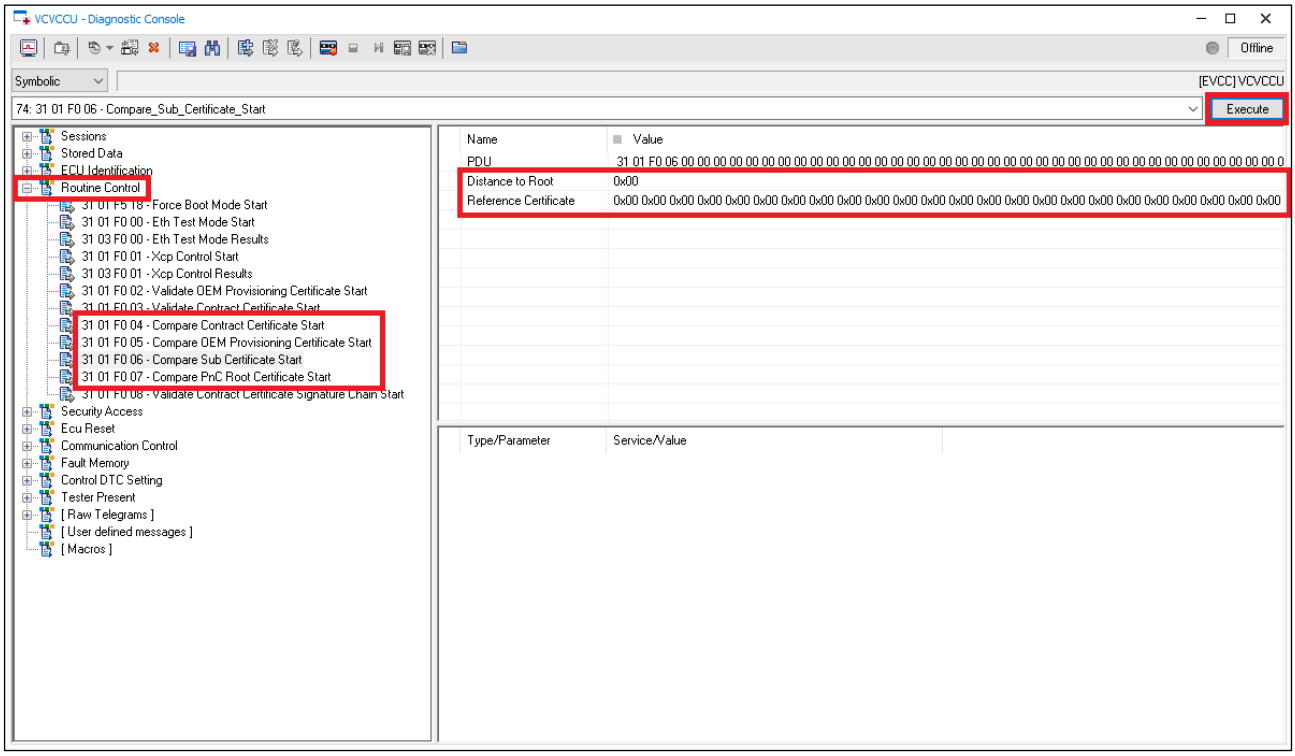
Validation of OEM Provisioning or Contract Certificate: Select the tab “Routine Control” in the diagnostic console. Please choose the requested routine control for certificate validation and click on the button “Execute”.



Validation of Contract Certificate Signature Chain: Select the tab “Routine Control” in the diagnostic console. Please choose the requested routine control for certificate validation and enter the reference time value. Then click on the button “Execute”.



Comparison of PnC Certificates: Select the tab “Routine Control” in the diagnostic console. Please choose the requested routine control for certificate comparison and enter the respective certificate. If the Sub Certificate shall be compared the distance to root (0 or 1) has to be entered in the field “Distance to Root” additionally. Then click on the button “Execute”.



Manual Configuration

Executing routine controls is also possible without CANoe. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session, e.g. every second. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Request Seed (Level 1):
XX: Seed (4 byte)
Request: 02 27 01 FF FF FF FF FF
Response: 06 67 01 XX XX XX XX FF

4. Send Key (Level 1):
XX: Key (4 byte)
Request: 06 27 02 XX XX XX XX FF
Response: 02 67 02 FF FF FF FF FF

The key can be calculated with the following algorithm and key constant:

- Key constant: 0xE3CA2342
- Algorithm: (((SEED * 0x6076DBAF) + 0x5397FB1) ^ ((~SEED * 0x72B6BF45) + 0xBC614E) ^ KEY_CONSTANT)

5. Execution of Routine Controls:

- Validation of Contract Certificate or OEM Provisioning Certificate

XX: PnC Certificate
- 02: Validate OEM Provisioning Certificate
- 03: Validate Contract Certificate

Request: 31 01 F0 XX FF FF FF FF

The following response indicates whether the certificate is valid or invalid.

Response: 71 01 F0 XX XX FF FF FF

XX:
- 00: Valid
- 01: Invalid

- Validation of Contract Certificate Signature Chain

XX: Reference Time Value

- Byte 4: Year (A raw value of 0 identifies the year 1985. A raw value of 24 identifies the year 2021)
- Byte 5: Month (1 to 12)
- Byte 6: Day (physical value = raw value/4)
- Byte 7: Hours (0 to 23)
- Byte 8: Minutes (0 to 59)
- Byte 9: Seconds (physical value = raw value/4)

Request: 31 01 F0 08 XX XX XX XX XX XX

The following response indicates whether the contract certificate signature chain is valid or invalid.

Response: 71 01 F0 08 XX FF FF FF

XX:
- 00: Valid
- 01: Invalid

- Comparison of PnC Certificates:

XX: PnC Certificate
- 04: Compare Contract Certificate
- 05: Compare OEM Provisioning Certificate
- 06: Compare Sub Certificate
- 07: Compare PnC Root Certificate

XX: Distance to Root Certificate
- 00: Distance to Root Certificate is 0
- 01: Distance to Root Certificate is 1

Note
The distance to root certificate parameter is only relevant if a sub certificate shall be compared (routine control F0 06). Otherwise, the distance to root certificate parameter is omitted and this byte is used to transmit the certificate.

XX: Certificate (800 byte)

Request: 31 01 F0 XX XX XX XX XX
Response: 30 08 14 AA AA AA AA AA
Request: 21 XX XX XX XX XX XX XX
Request: 22 XX XX XX XX XX XX XX
...

Note
This description does not include all request/response-messages due to the size of the TLS certificate (800 byte). In order to write the TLS certificate correctly the transport protocol according to ISO 15765-2 [6] has to be implemented.

The following response indicates whether the certificates are identical or not identical.

Response: 71 01 F0 XX XX FF FF FF

XX:
- 00: Not identical
- 01: Identical

5.2.1.2.13 Configuration of Charging Schedules

The VC-EVCC provides the possibility to use Charging Schedules according to ISO 15118. This feature can be activated via UDS as described in this chapter.

The service structure is defined as 1 byte.

Value	Description
0x00	Charging Schedules are deactivated (default)
0x01	Charging Schedules are activated

Note

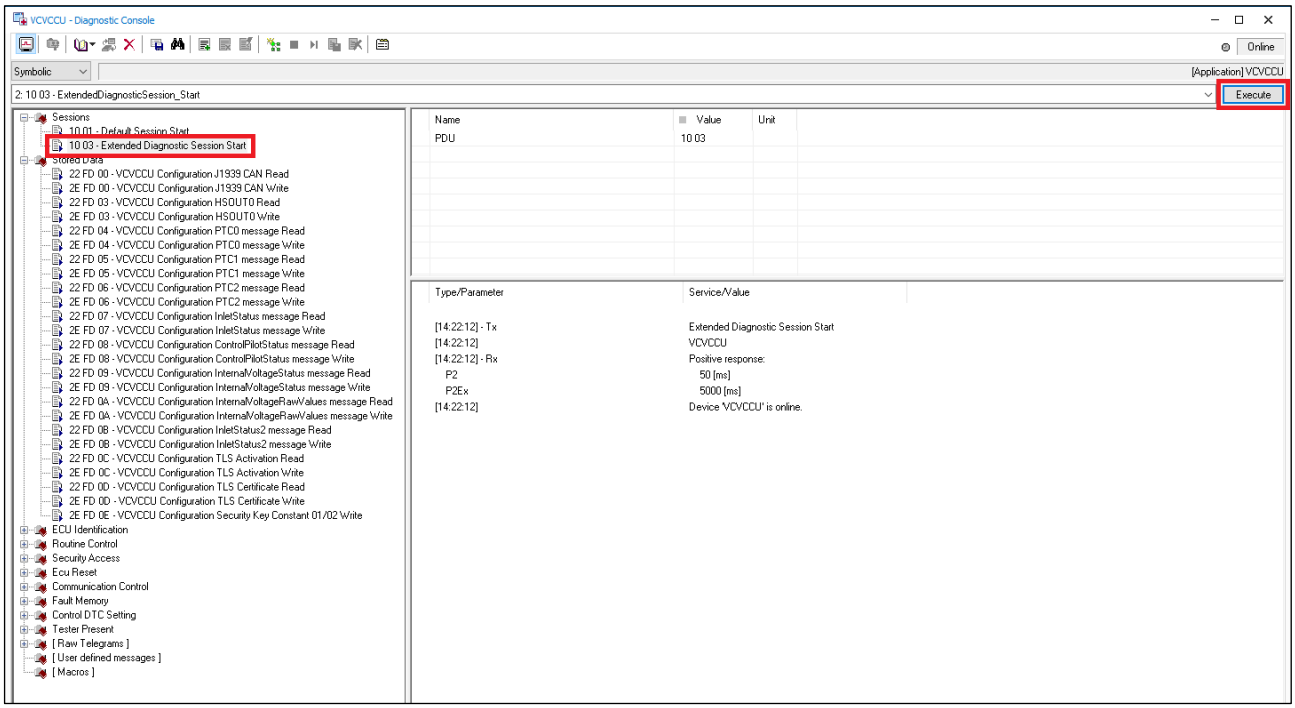
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

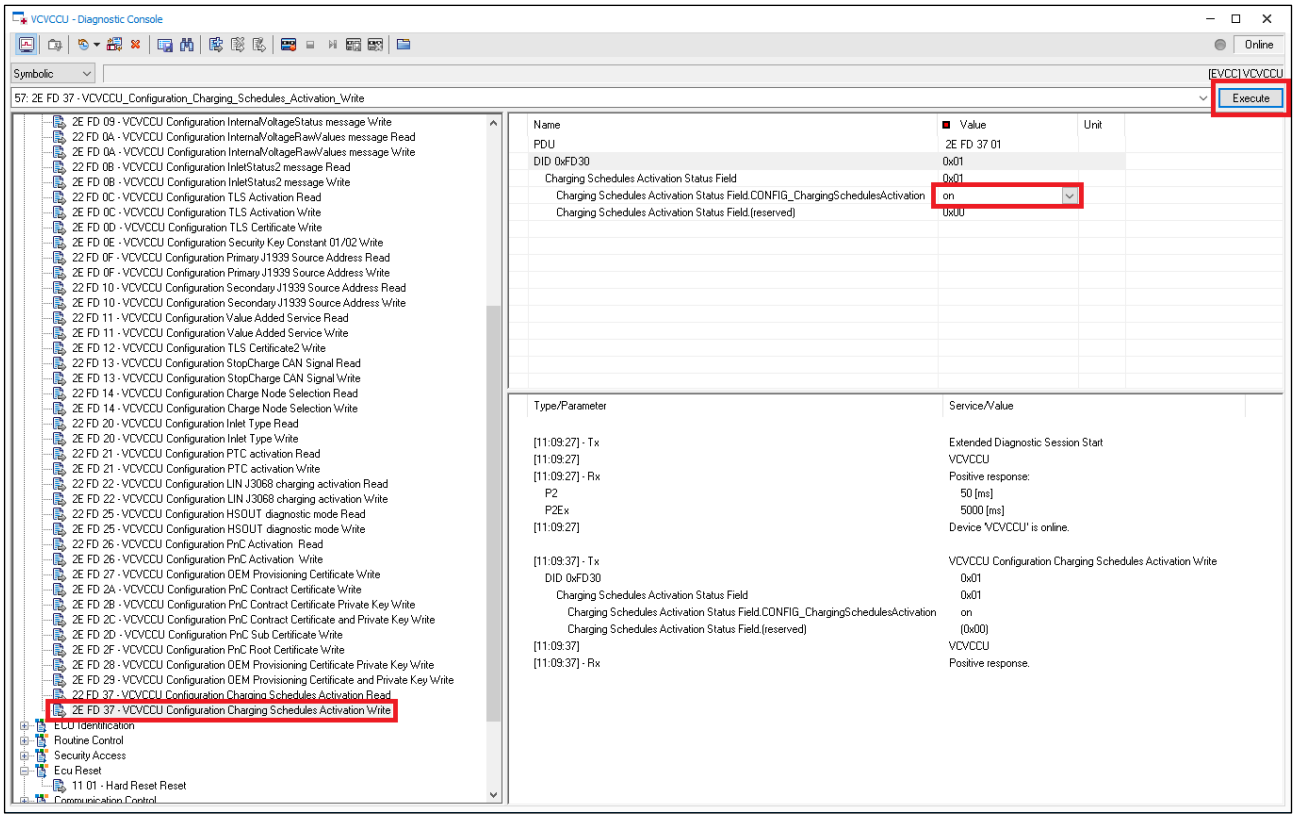
Configuration with CANoe/CANalyzer

The configuration of Charging Schedules can be executed with CANoe/CANalyzer according to the following description.

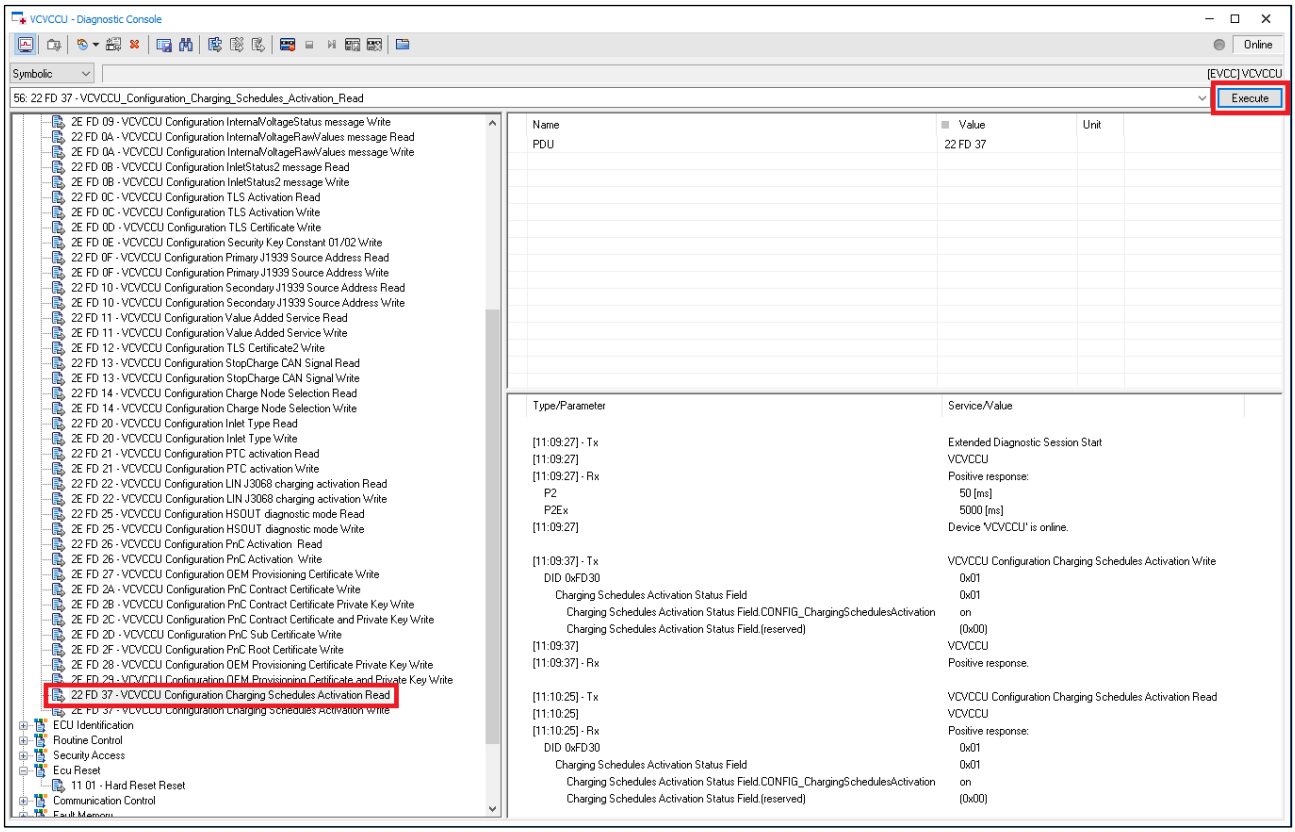
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 37 – VCVCCU Configuration Charging Schedules Activation Write”. Please choose the requested Charging Schedules configuration (“on” or “off”) and click on the button “Execute”. Please note that the response must be positive.



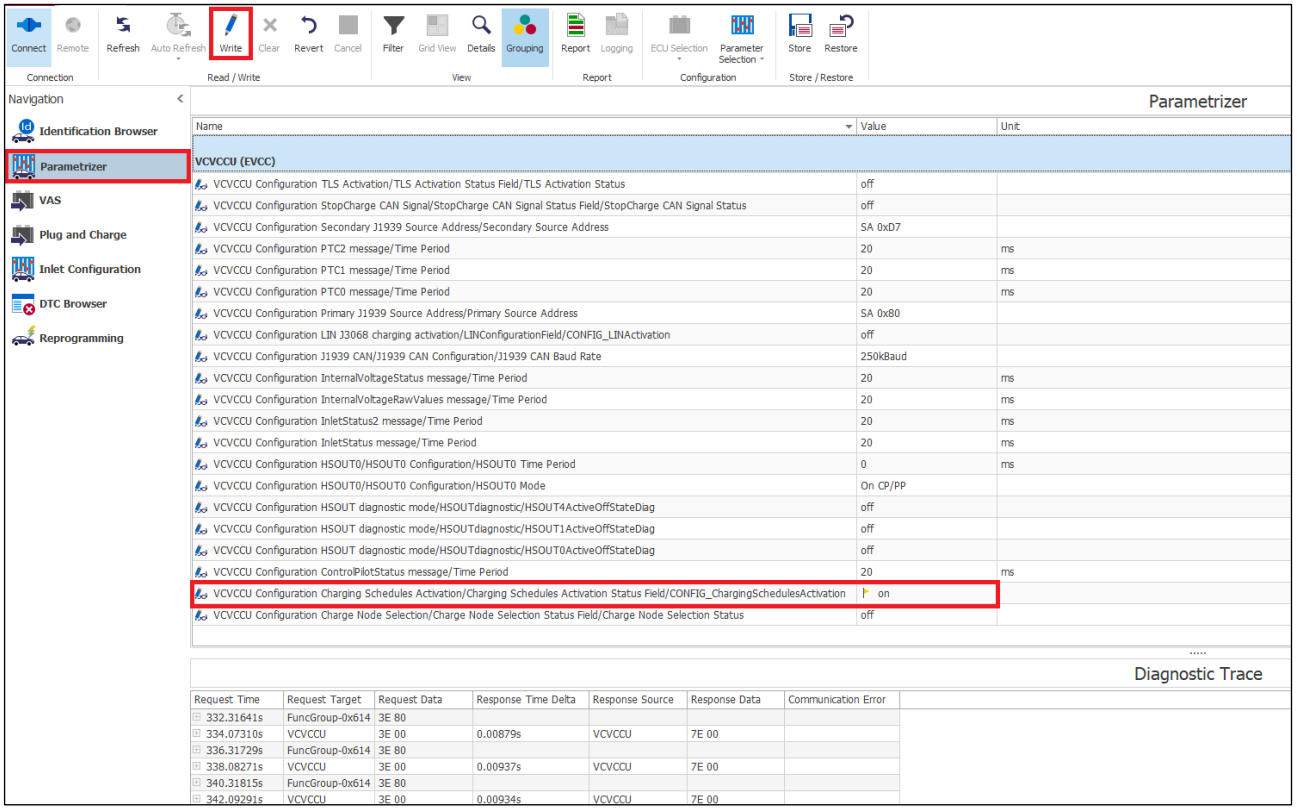
3. By executing the command “22 FD 37 – VCVCCU Configuration Charging Schedules Activation Read” the current configuration of the Charging Schedules can be verified.



Configuration with Indigo

The configuration of charging schedules can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration Charging Schedules Activation/Charging Schedules Activation Status Field/CONFIG_ChargingSchedulesActivation”. Select the requested charging schedules configuration (“on” or “off”) and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Charging Schedules:
XX:
- 0x00: Charging Schedules are deactivated
- 0x01: Charging Schedules are activated

Request: 04 2E FD 37 XX FF FF FF
Response: 03 6E FD 37 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present Charging Schedules configuration, the following communication has to be executed.

4. Read Charging Schedules configuration:
Request: 03 22 FD 37 FF FF FF FF
Response: 04 62 FD 37 XX FF FF FF

5.2.1.2.14 Configuration of Inlet Type

The VC-EVCC provides the possibility to configure the lock motor movement time, the lock motor overload protection time and the internal proximity pin (PP) resistor of the vehicle inlet.

The service structure is defined as 4 bytes.

Byte No.	Description	Value
Byte 0	Lock motor movement time	600 ms (default)
Byte 1 and 2	Lock motor overload protection time	2650 ms (default)
Byte 3	Internal resistor between PP and PE of the vehicle inlet ▶ CCS Combo 1: 2,7 kΩ ▶ CCS Combo 2: 4,7 kΩ	2,7 kΩ: 0 4,7 kΩ: 1 (default)

The configuration of the PP resistor determines whether the VC-EVCC considers a CCS Combo 1 or Combo 2 inlet as connected which affects the Proximity Pin evaluation.

Note

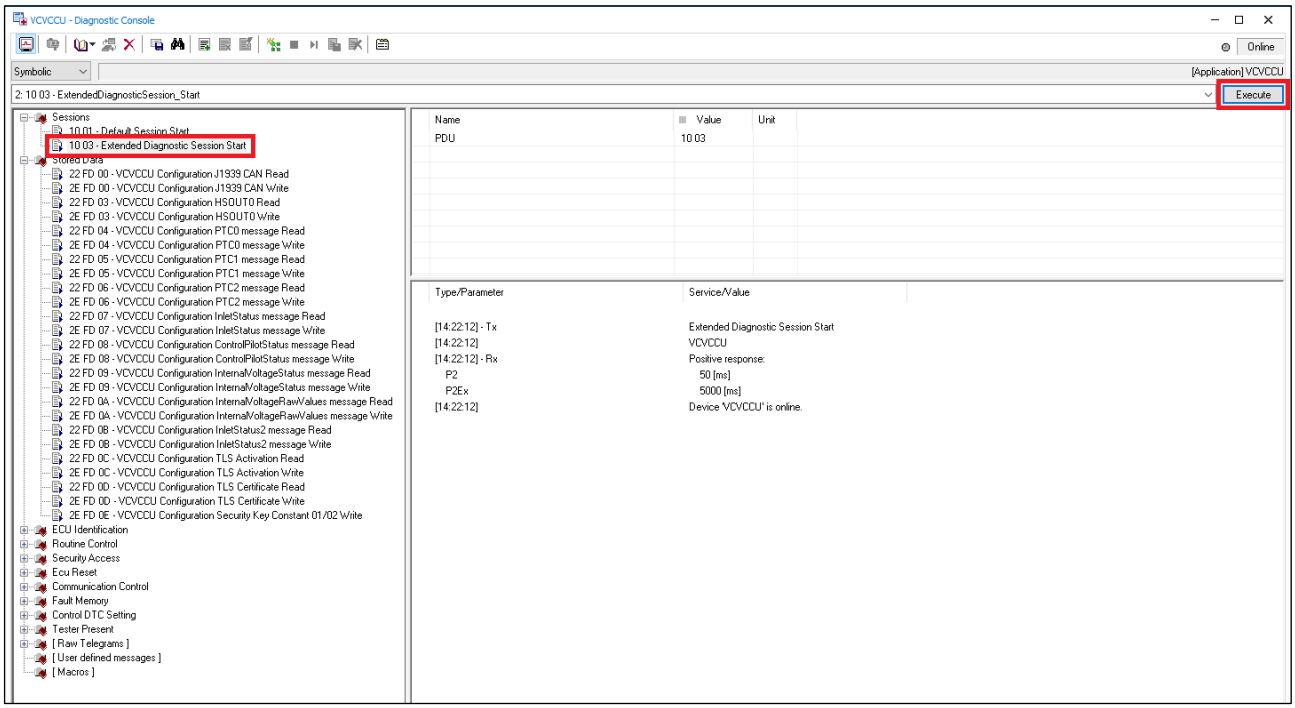
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

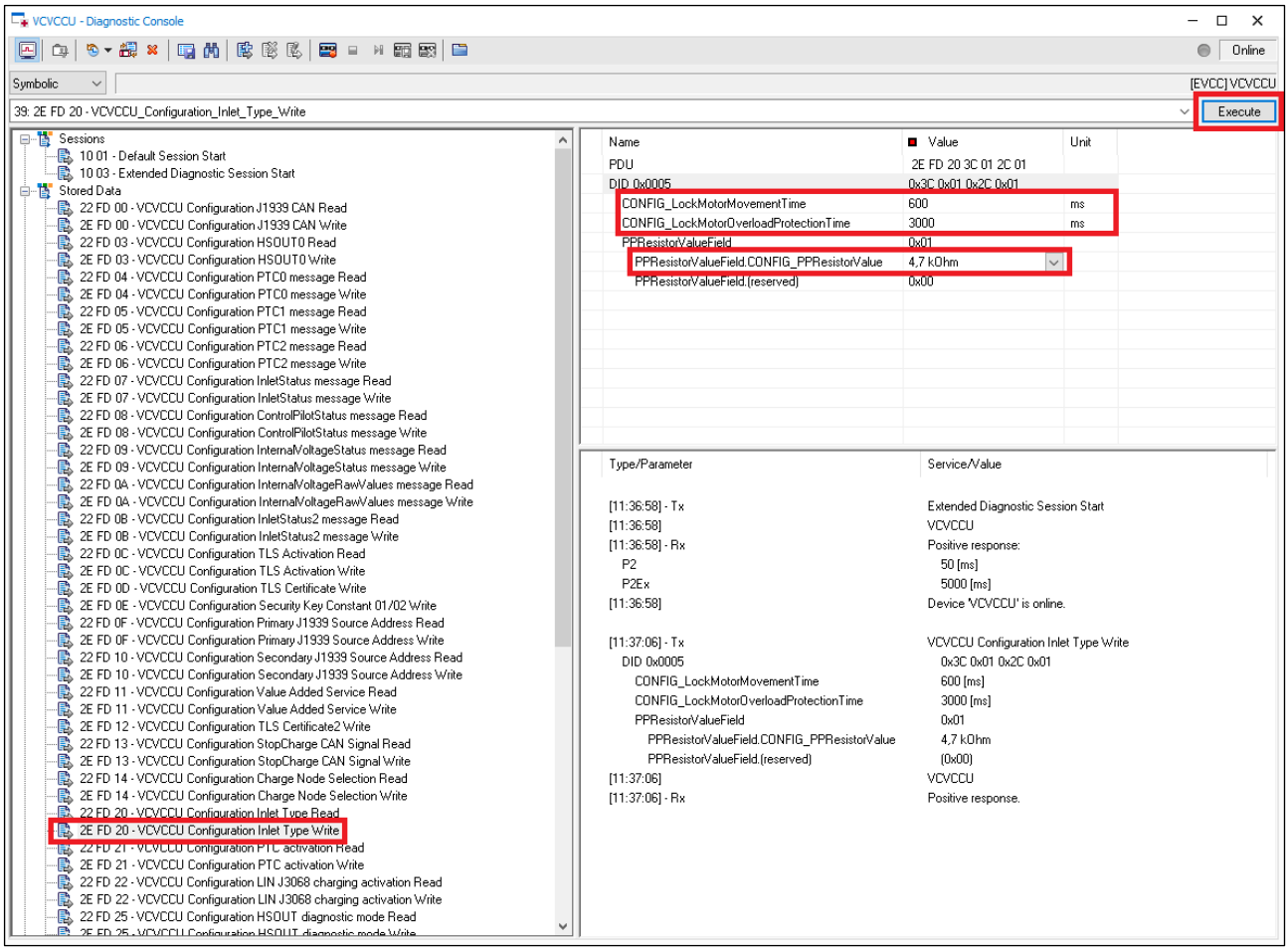
Configuration with CANoe/CANalyzer

The inlet type configuration can be executed with CANoe/CANalyzer according to the following description.

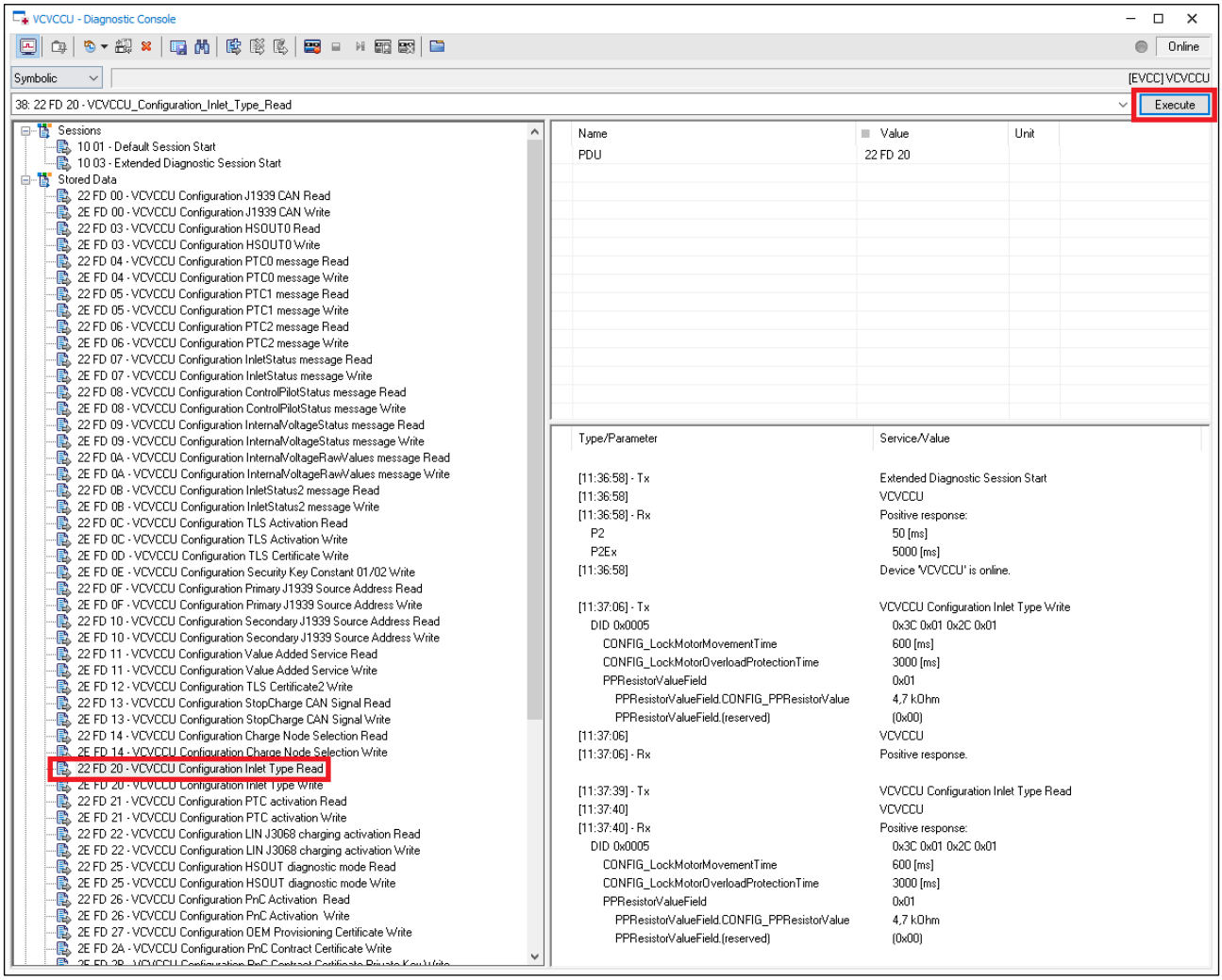
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 20 – VCVCCU Configuration Inlet Type Write”. Please choose the requested inlet type configuration and click on the button “Execute”. Please note that the response must be positive.



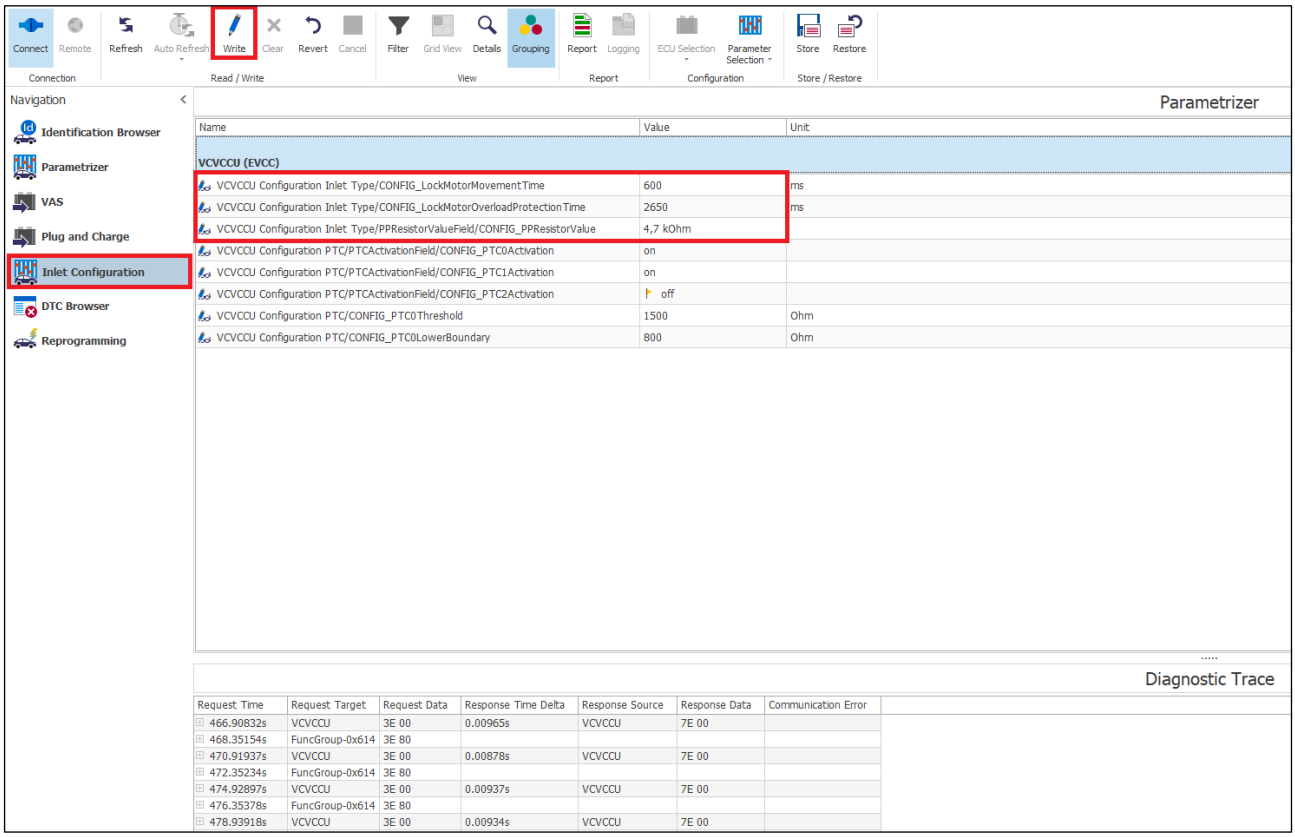
3. By executing the command “22 FD 20 – VCVCCU Configuration Inlet Type Read” the current inlet type configuration can be verified.



Configuration with Indigo

The configuration of the inlet type can be executed with Indigo according to the following description.

1. Select the tab “Inlet Configuration” and choose the requested configuration of the inlet parameters (Lock Motor Movement Time, Lock Motor Overload Protection Time, PP resistor). Click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Inlet type configuration:
XX: Lock motor movement time = XX * 10ms

XX XX: Lock motor overload protection time = XX XX * 10ms

XX: Internal PP resistor of the vehicle inlet
- 0x00: 2,7 kΩ
- 0x01: 4,7 kΩ

Request: 04 2E FD 20 XX XX XX XX
Response: 03 6E FD 20 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present inlet type configuration, the following communication has to be executed.

4. Read inlet type configuration:
Request: 03 22 FD 20 FF FF FF FF
Response: 04 62 FD 20 XX XX XX XX

5.2.1.2.15 Configuration of Temperature Sensors

The VC-EVCC provides the possibility to activate or deactivate the temperature inputs PTC0 (AC charging) as well as PTC1 and PTC2 (DC charging). Furthermore, the lower boundary and the threshold of the PTC0 can be configured.

The service structure is defined as 5 bytes.

Byte No.	Bit Pos.	Description	Value
Byte 0	0	PTC0 Activation	Off: 0 On: 1 (default)
Byte 0	1	PTC1 Activation	Off: 0 On: 1 (default)
Byte 0	2	PTC2 Activation	Off: 0 (default) On: 1
Byte 1 and 2	-	PTC0 Threshold (Resistance value in a range from 400 to 5000 Ohm)	1500 Ohm (default)
Byte 3 and 4	-	PTC0 Lower Boundary (Resistance value in a range from 400 to 5000 Ohm)	600 Ohm (default)

Note

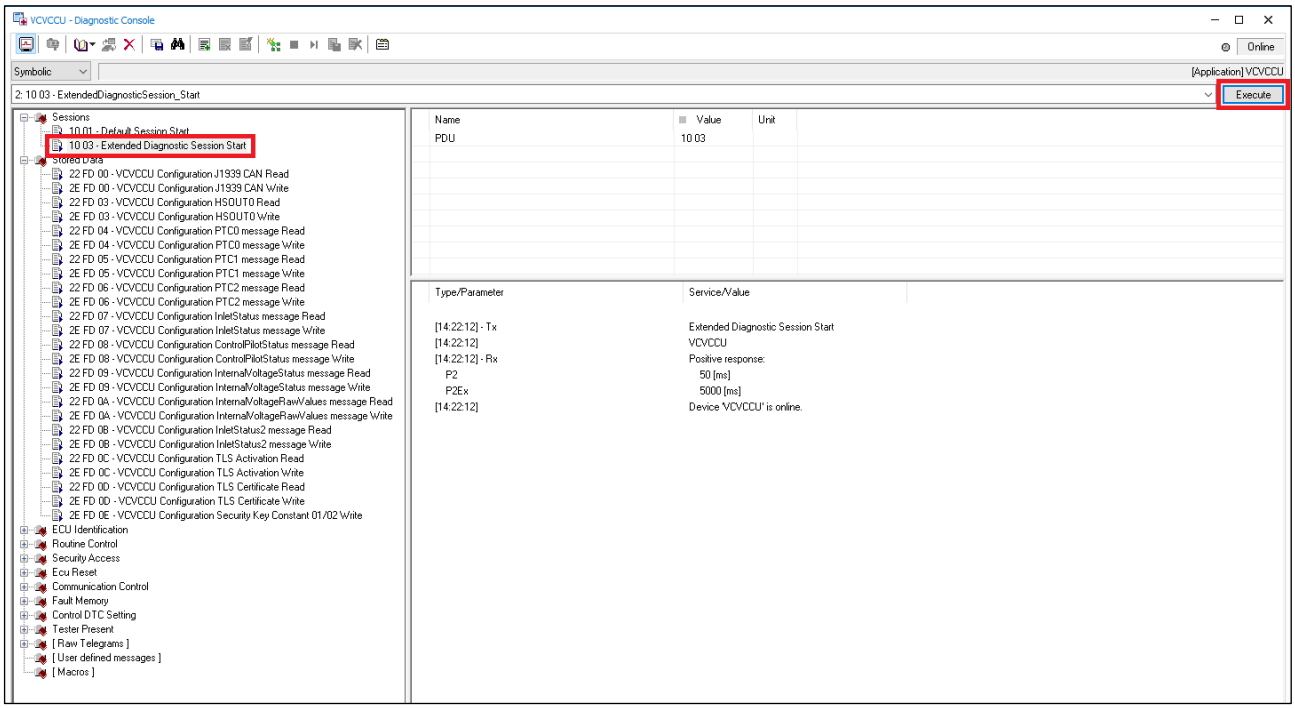
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

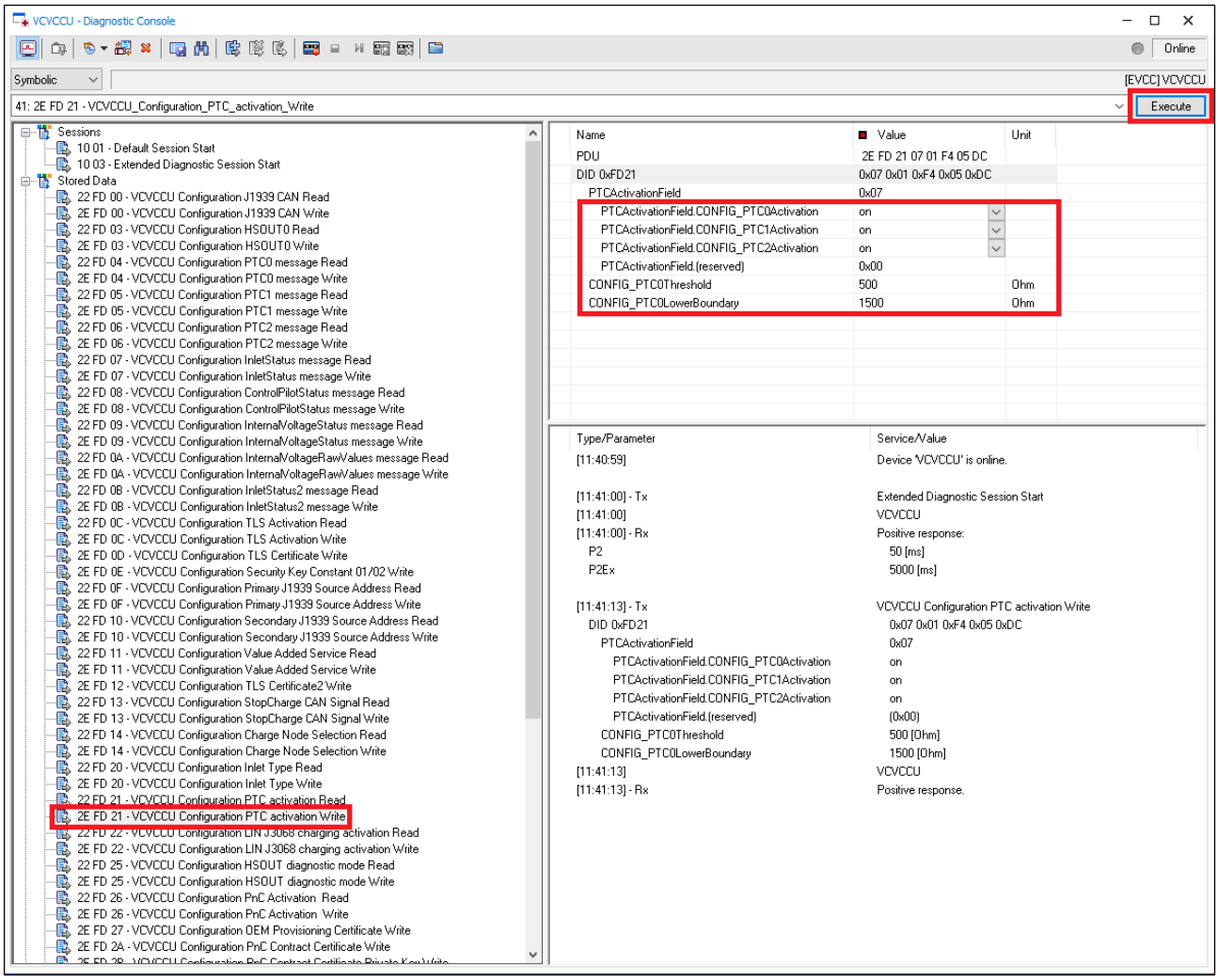
Configuration with CANoe/CANalyzer

The configuration of temperature sensors can be executed with CANoe/CANalyzer according to the following description.

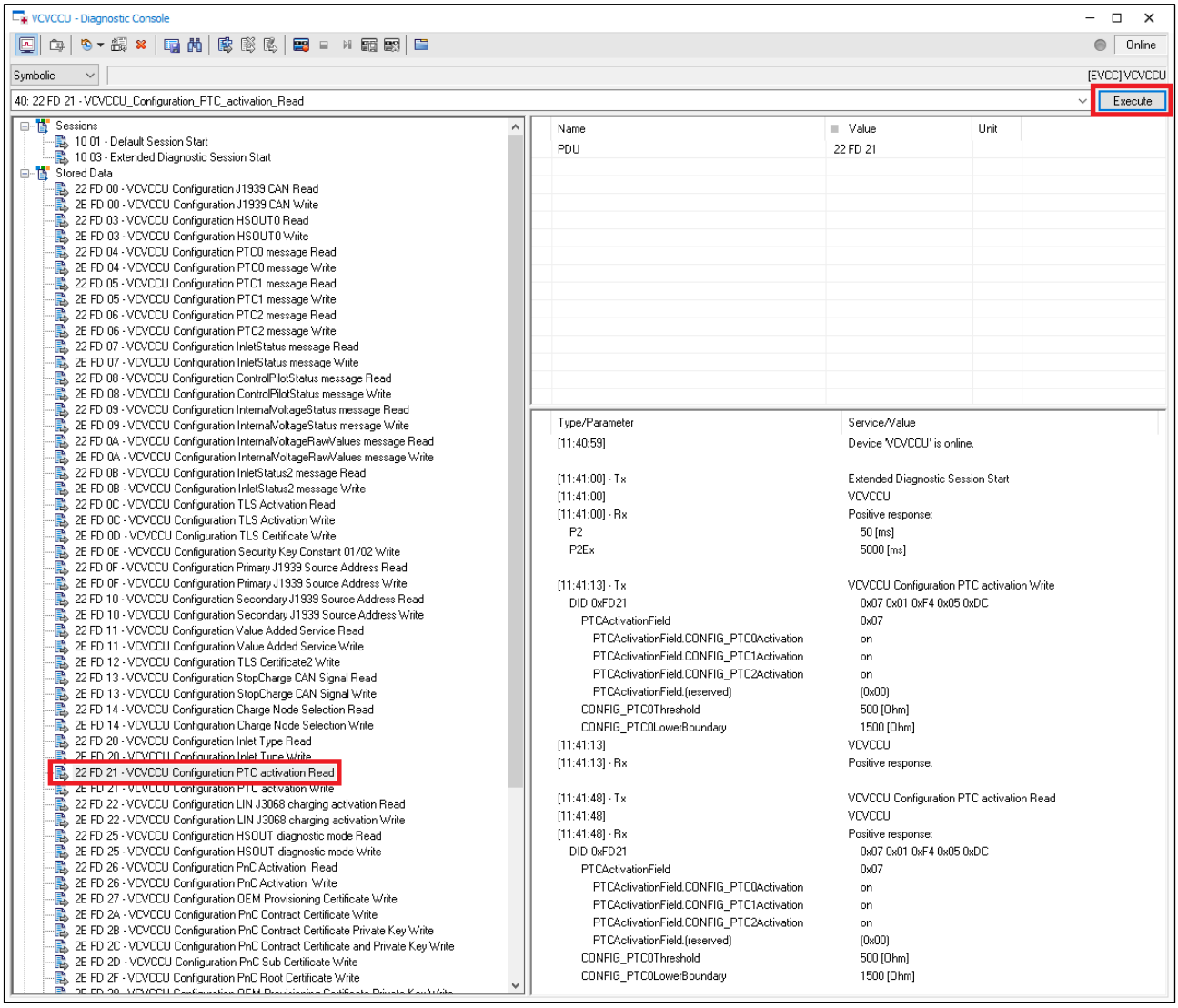
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 21 – VCVCCU Configuration PTC Activation Write”. Please choose the requested temperature sensor configuration and click on the button “Execute”. Please note that the response must be positive.



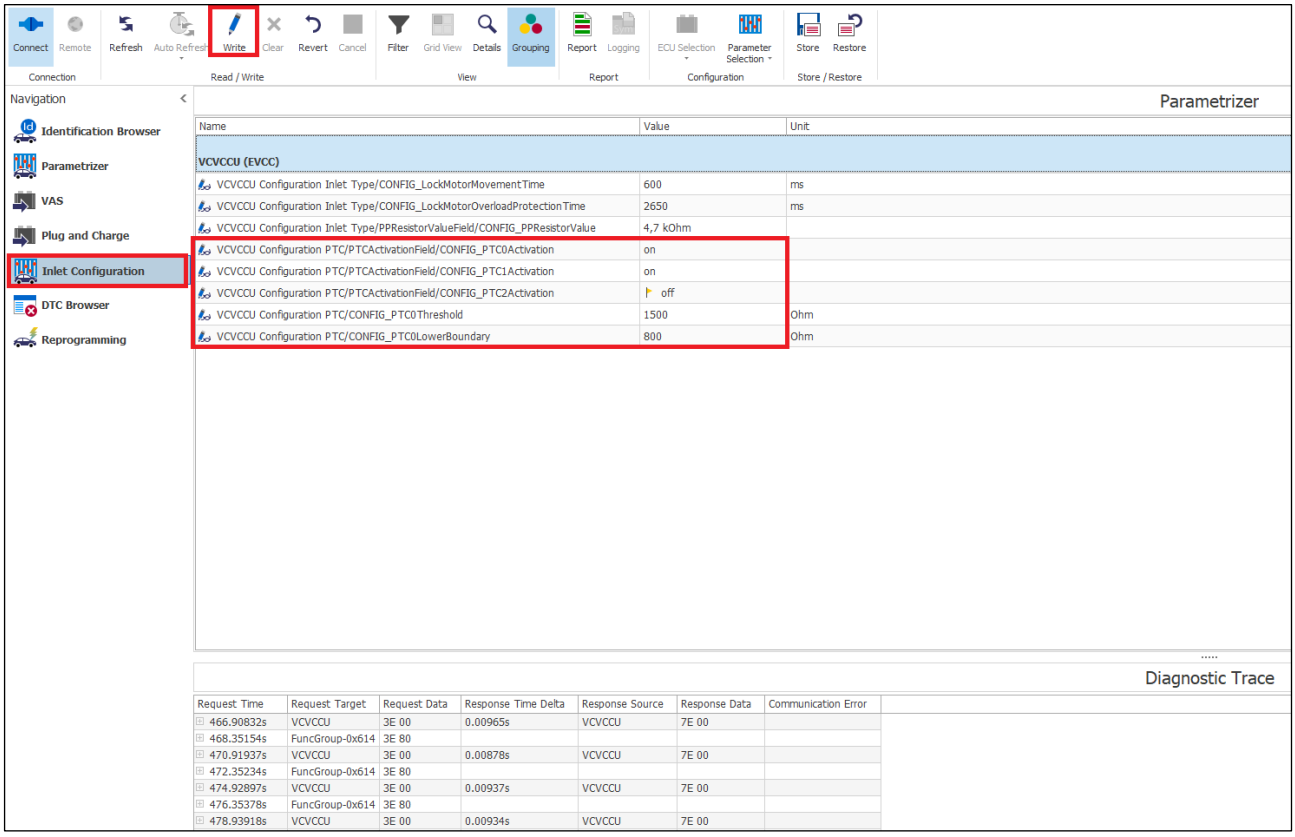
3. By executing the command “22 FD 21 – VCVCCU Configuration PTC Activation Read” the current configuration of the temperature sensors can be verified.



Configuration with Indigo

The configuration of temperature sensors can be executed with Indigo according to the following description.

1. Select the tab “Inlet Configuration” and choose the requested configuration of the temperature sensors (Activation/Deactivation of PTC0/PTC1/PTC2, PTC0 Threshold, PTC0 Lower Boundary). Click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Temperature sensor configuration:
XX: PTC Activation
- 0000 000Xb: PTC0 Activation/Deactivation (Off: 0, On: 1)
- 0000 00X0b: PTC1 Activation/Deactivation (Off: 0, On: 1)
- 0000 0X00b: PTC2 Activation/Deactivation (Off: 0, On: 1)

Note
At least one temperature sensor, either PTC1 or PTC2, must be activated for DC charging.

XX XX: PTC0 Threshold (Resistance value in Ohm)

XX XX: PTC0 Lower Boundary (Resistance value in Ohm)

Request: 04 2E FD 21 XX XX XX XX XX
Response: 03 6E FD 21 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present temperature sensor configuration, the following communication has to be executed.

4. Read temperature sensor configuration:
Request: 03 22 FD 21 FF FF FF FF
Response: 04 62 FD 21 XX XX XX XX XX

5.2.1.2.16 Configuration of Three-phase AC Charging via LIN (SAE J3068)

The VC-EVCC provides the possibility to use three-phase AC charging via LIN according to SAE J3068. This feature can be activated via UDS as described in this chapter.

The service structure is defined as 1 byte.

Value	Description
0x00	Three-phase AC charging via LIN is deactivated (default)
0x01	Three-phase AC charging via LIN is activated

Note

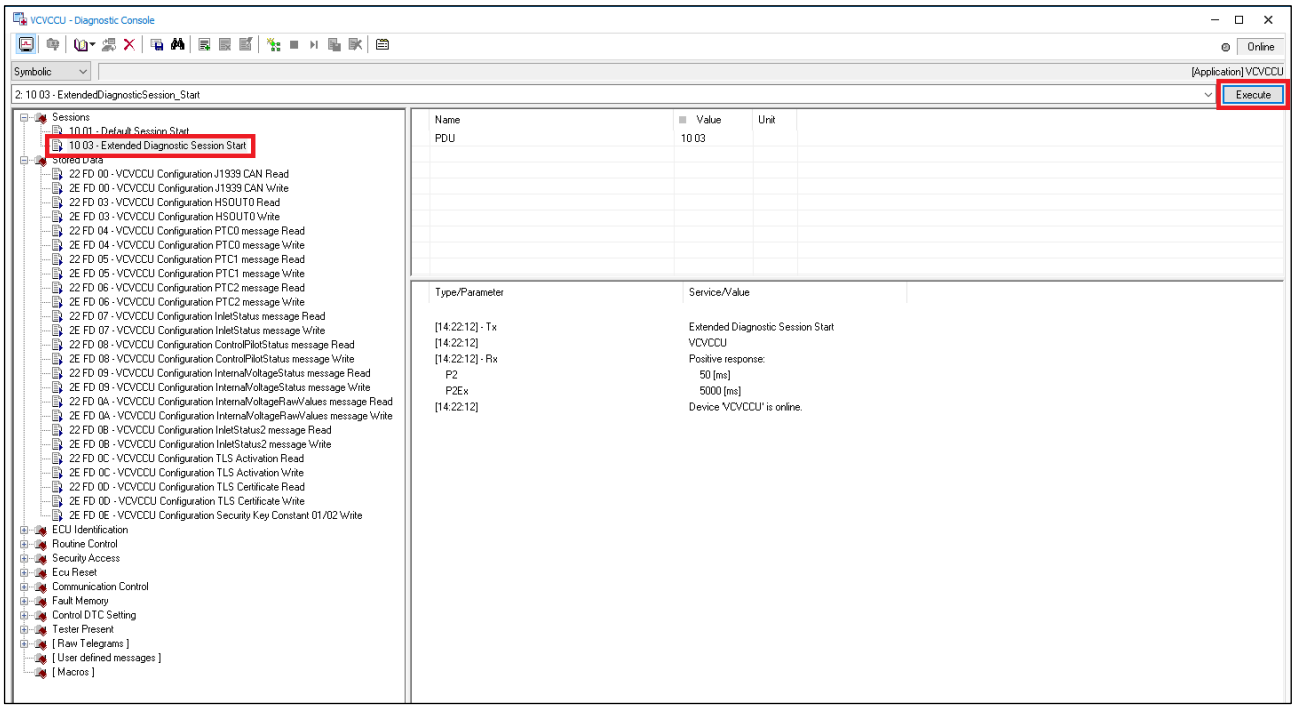
An update of the parameter requires a reboot of the VC-EVCC to be applicable.

The diagnostic service “Write Data By Identifier” is only available in the application extended session.

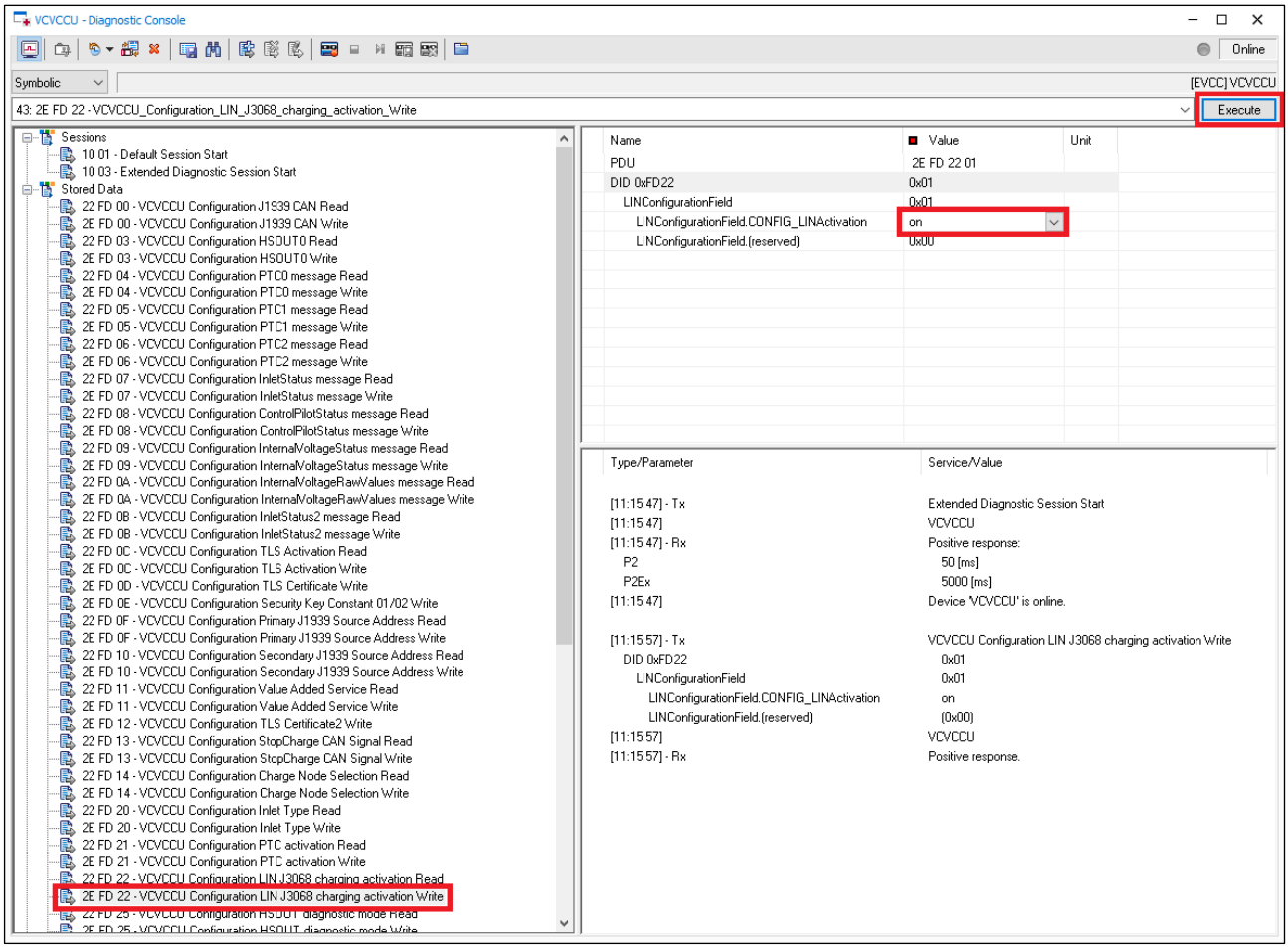
Configuration with CANoe/CANalyzer

The configuration of three-phase AC charging via LIN can be executed with CANoe/CANalyzer according to the following description.

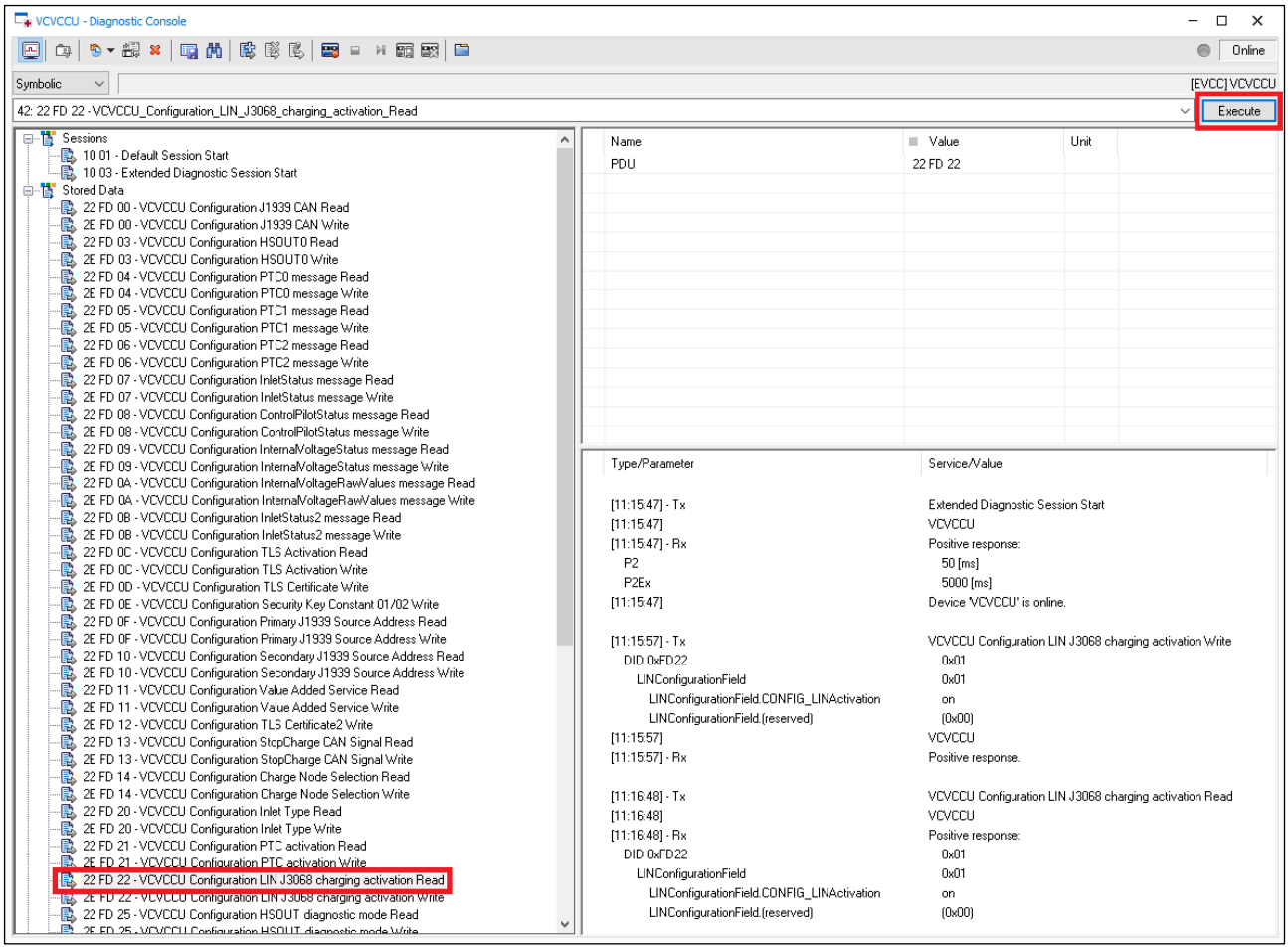
1. Select the tab “Sessions” and click on “10 03 – Extended Diagnostic Session Start”. Click on the button “Execute” to start the Extended Diagnostic Session. Please note that the response must be positive.



2. Select the tab “Stored Data” and click on “2E FD 22 – VCVCCU Configuration LIN J3068 Charging Activation Write”. Please choose the requested LIN J3068 charging configuration (“on” or “off”) and click on the button “Execute”. Please note that the response must be positive.



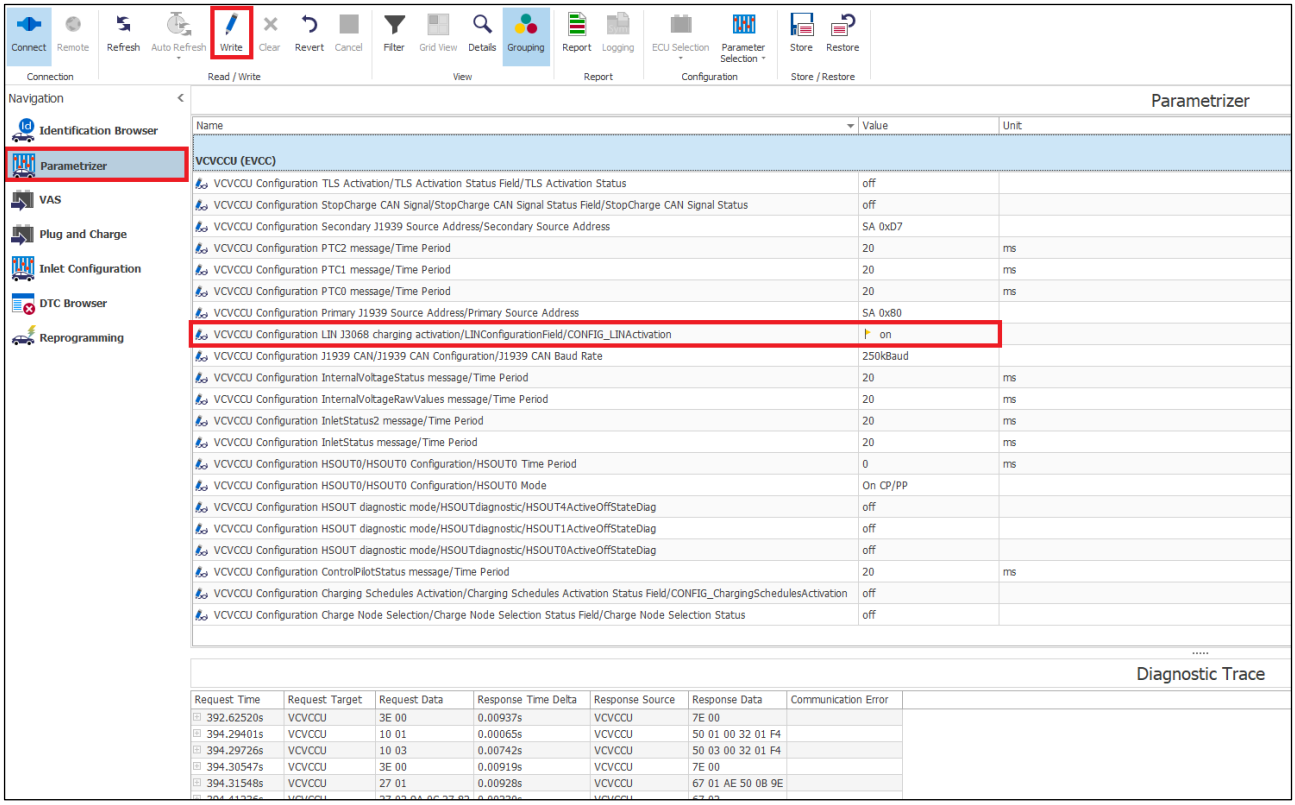
3. By executing the command “22 FD 22 – VCVCCU Configuration LIN J3068 Charging Activation Read” the current configuration of the LIN J3068 charging can be verified.



Configuration with Indigo

The configuration of three-phase AC charging via LIN can be executed with Indigo according to the following description.

1. Select the tab “Parametrizer” and click on the data field Value of the VC-EVCC application “VCVCCU Configuration LIN J3068 charging activation/LINConfigurationField/CONFIG_LINActivation”. Select the requested LIN J3068 charging configuration (“on” or “off”) and click on the button “Write” to execute the configuration.



Manual Configuration

Reprogramming is also possible without CANoe/CANalyzer. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Three-phase AC charging via LIN:
XX:
- 0x00: Three-phase AC charging is deactivated
- 0x01: Three-phase AC charging is activated

Request: 04 2E FD 22 XX FF FF FF
Response: 03 6E FD 22 FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

In order to read the present three-phase AC charging via LIN configuration, the following communication has to be executed.

4. Read three-phase AC charging via LIN configuration:
Request: 03 22 FD 22 FF FF FF FF
Response: 04 62 FD 22 XX FF FF FF

5.2.1.2.17 Configuration of Security Key Constant

The VC-EVCC provides the possibility to configurate the security key constant of the security access.

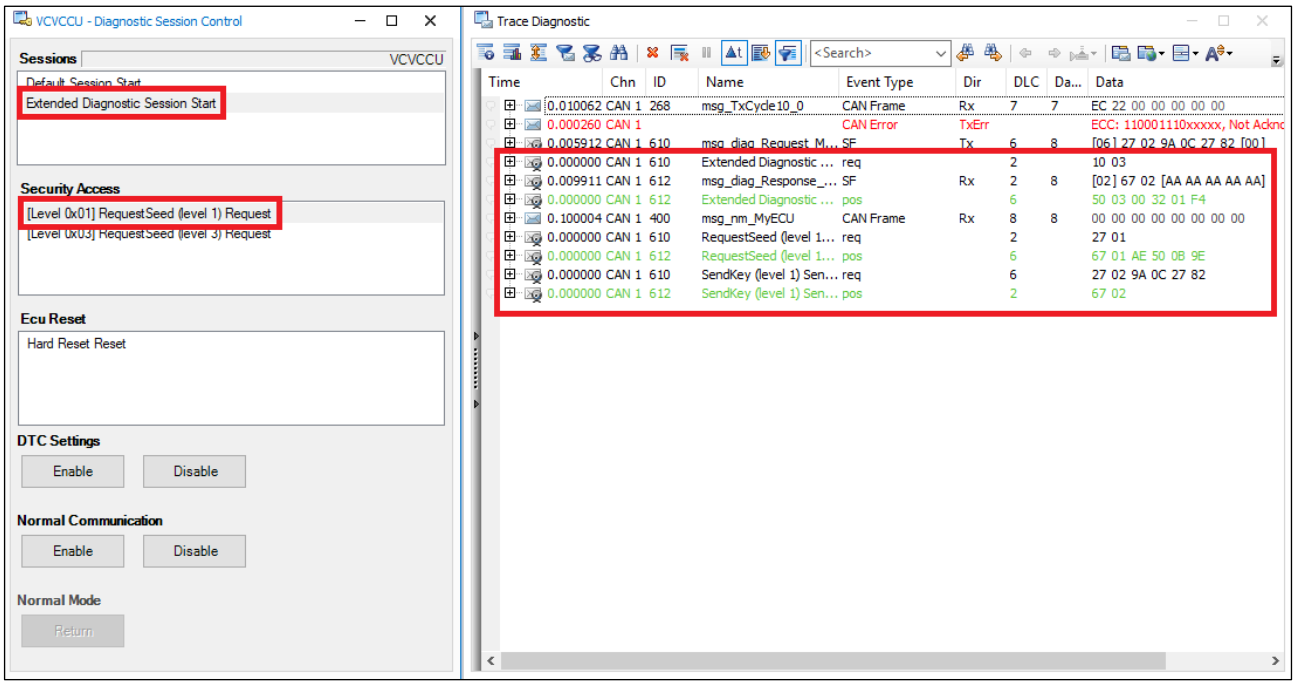
The service structure is defined as 4 bytes.

Value	Description
0xE3CA2342 (default)	Security Key Constant

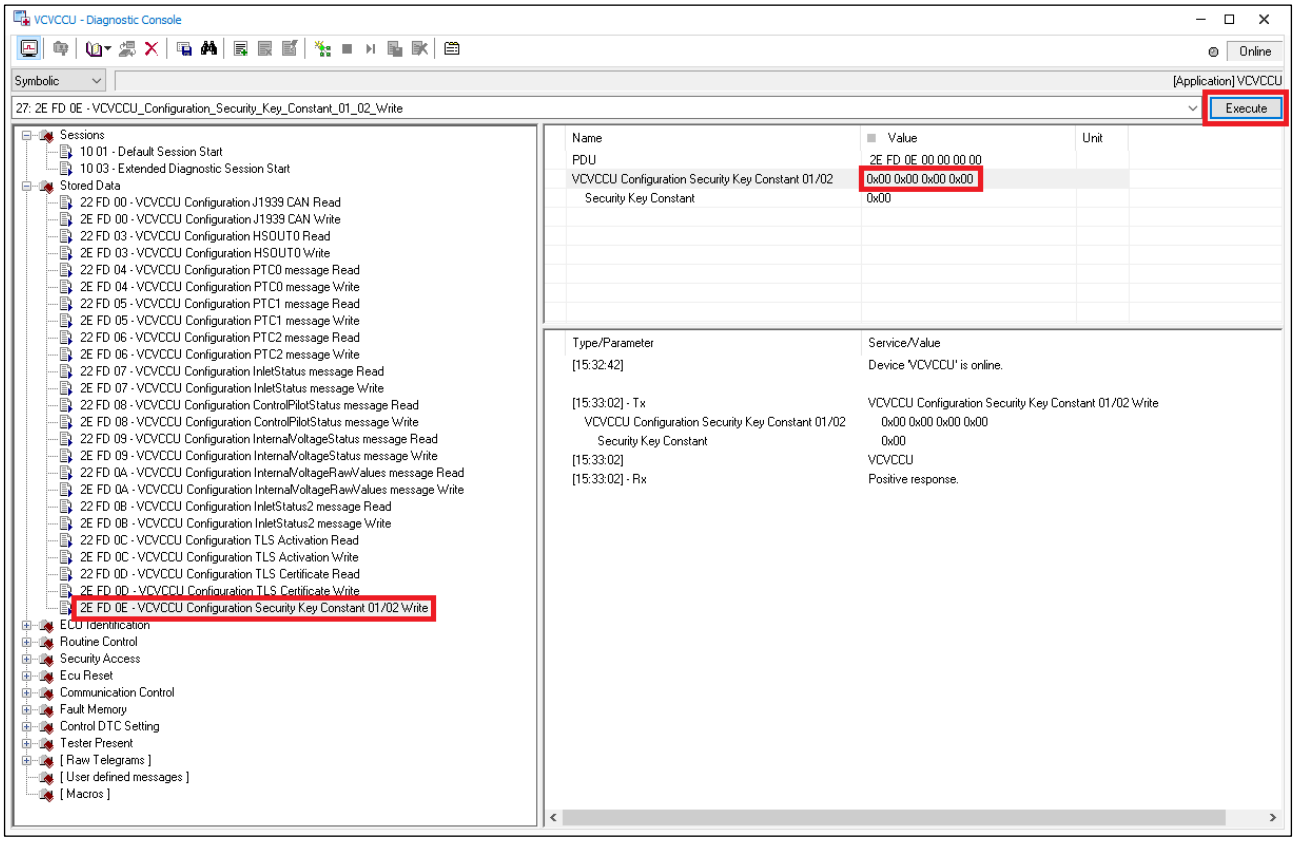
Configuration with CANoe/CANalyzer

The configuration of the security key constant can be executed with CANoe/CANalyzer according to the following description.

1. The configuration of the security key constant requires the diagnostic services “Extended Session” and “Security Access”. Therefore, select the window “VCVCCU – Diagnostic Session Control” and double-click on “Extended Session Start”. Continue by double-clicking on “[Level 0x01] Request Seed (level 1) Request”. Please note that the responses must be positive. The request and response messages are shown in the window “Trace Diagnostic”.



2. To configurate the security key constant, select the window “VCVCCU – Diagnostic Console” and select the tab “Stored Data”. Click on “2E FD 0E – VCVCCU Configuration Security Key Constant 01/02 Write”. Write the requested security key constant (4 byte) and click on “Execute”. Please note that the response must be positive.



Manual Configuration

Reprogramming is also possible without CANoe. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Extended Session:
Request: 02 10 03 FF FF FF FF FF
Response: 06 50 03 00 32 01 F4 FF

2. Tester Present:
Request: 02 3E 00 FF FF FF FF FF
Response: 02 7E 00 FF FF FF FF FF

Caution
The message “Tester Present” has to be sent cyclically in order to keep the VC-EVCC in the extended session, e.g. every second. Otherwise the extended session will be terminated after approximately 4 – 5 seconds.

3. Request Seed (Level 1):
XX: Seed
Request: 02 27 01 FF FF FF FF FF
Response: 06 67 01 XX XX XX XX FF

4. Send Key (Level 1):
XX: Key
Request: 06 27 02 XX XX XX XX FF
Response: 02 67 02 FF FF FF FF FF

The key can be calculated with the following algorithm and key constant:

- Key constant: 0xE3CA2342
- Algorithm: (((SEED * 0x6076DBAF) + 0x5397FB1) ^ ((~SEED * 0x72B6BF45) + 0xBC614E) ^ KEY_CONSTANT)

5. Security Key Constant (4 byte):
XX: Security Key Constant (4 byte)
Request: 07 2E FD 0E XX XX XX XX
Response: 03 6E FD 0E FF FF FF FF

Note
In some cases the response message might include the value “AA” instead of “FF”.

5.2.1.3 ECU Identification

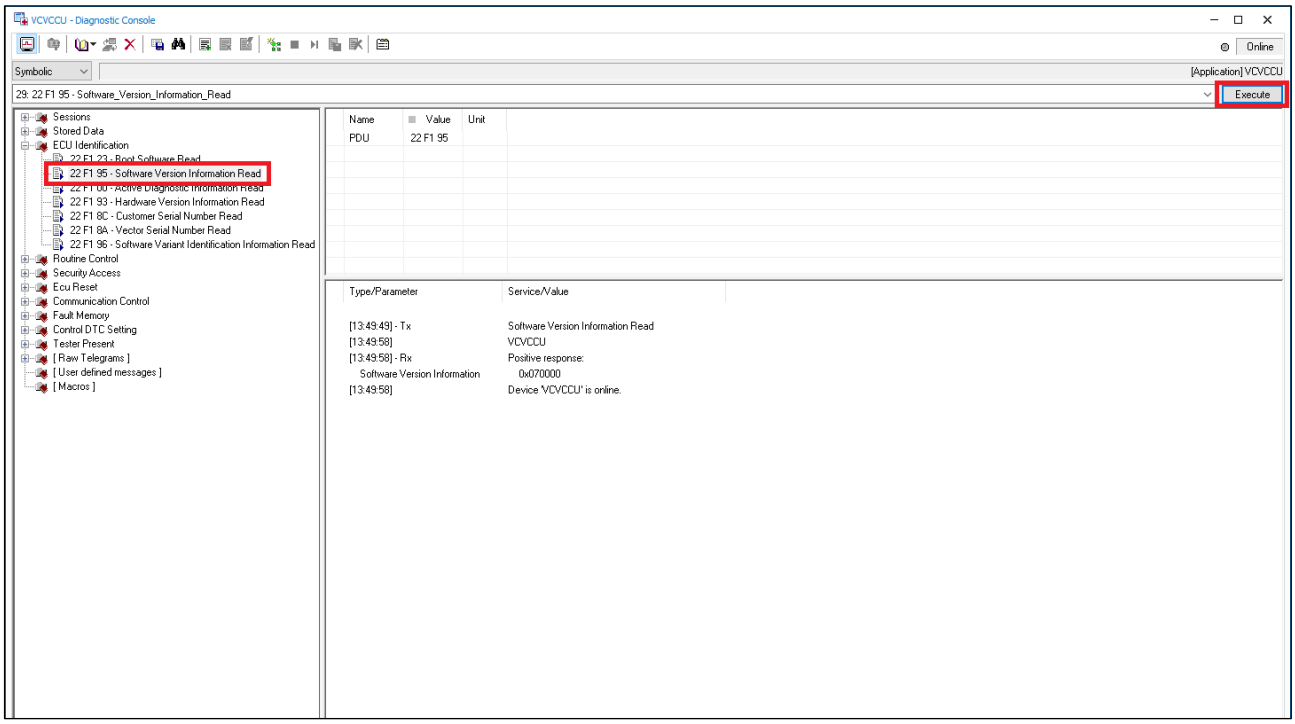
5.2.1.3.1 Read Software Version Information

By using the diagnostic service “Read Data By Identifier” (0x22) – DID 0xF195 it is possible to read the VC-EVCC software version information.

Reading with CANoe/CANalyzer

Reading the VC-EVCC software version information can be executed with CANoe/CANalyzer according to the following description.

1. Select the tab “ECU Identification” and click on “22 F1 95 – Software Version Information Read”. Then click on the button “Execute”.



Manual Reading

Reading the VC-EVCC software version information is also possible without CANoe. In this case, the following CAN Messages (UDS/ TP) must be send on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Read Software Version Information:
   Request: 03 22 F1 95 FF FF FF FF
   Response: 06 62 F1 95 XX XX XX FF, e.g. 06 62 F1 95 08 00 00 FF

The “VC-EVCC Software Version Information” is included in 3 bytes (Major.Minor.Patch). Accordingly, the above example shows software version 8.0.0.

Note
In some cases the response message might include the value “AA” instead of “FF”.

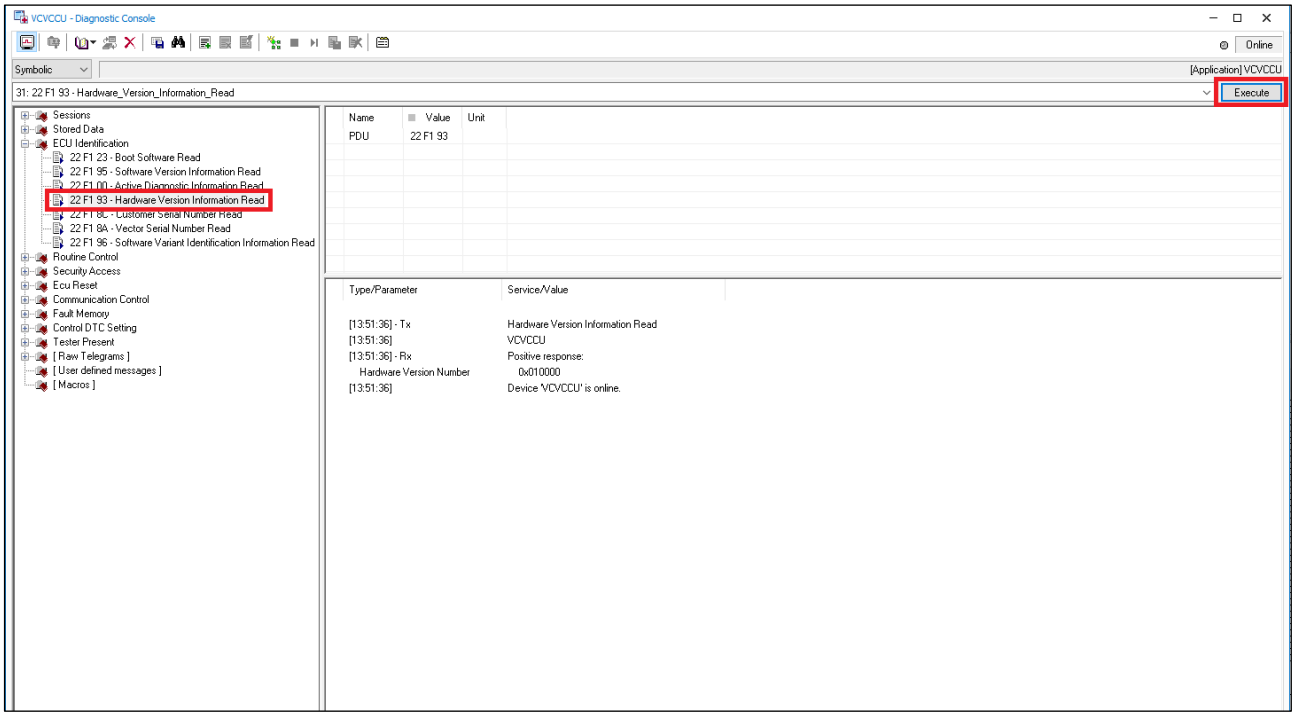
5.2.1.3.2 Read Hardware Version Information

By using the diagnostic service “Read Data By Identifier” (0x22) – DID 0xF193 it is possible to read the VC-EVCC hardware version information.

Reading with CANoe/CANalyzer

Reading the VC-EVCC hardware version information can be executed with CANoe/CANalyzer according to the following description.

1. Select the tab “ECU Identification” and click on “22 F1 93 – Hardware Version Information Read”. Then click on the button “Execute”.



Manual Reading

Reading the VC-EVCC hardware version information is also possible without CANoe. In this case, the following CAN Messages (UDS/ TP) must be sent on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

1. Read Hardware Version Information:
   Request: 03 22 F1 93 FF FF FF FF
   Response: 06 62 F1 93 XX XX XX FF, e.g. 06 62 F1 95 01 00 00 FF

The “VC-EVCC Hardware Version Information” is included in 3 bytes (Major.Minor.Patch). Accordingly, the above example shows hardware version 1.0.0.

Note
In some cases the response message might include the value “AA” instead of “FF”.

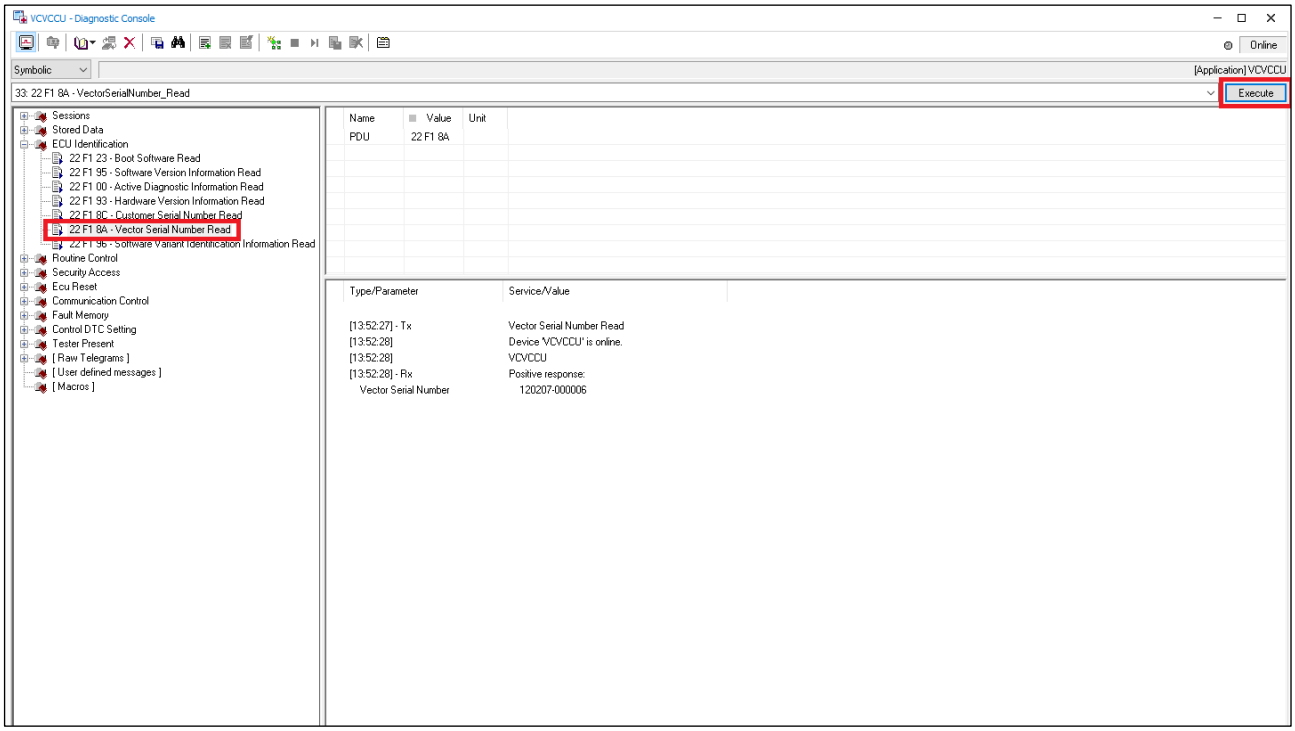
5.2.1.3.3 Read Vector Serial Number Information

By using the diagnostic service “Read Data By Identifier” (0x22) – DID 0xF18A it is possible to read the Vector serial number information.

Reading with CANoe/CANalyzer

Reading the Vector serial number information can be executed with CANoe/CANalyzer according to the following description.

1. Select the tab “ECU Identification” and click on “22 F1 8A – Vector Serial Number Read”. Then click on the button “Execute”.



Manual Reading

Reading the Vector serial number information of the VC-EVCC is also possible without CANoe. In this case, the following CAN Messages (UDS/ TP) must be send on the diagnostic CAN (CAN0) manually:

CAN-Identifier:
Tester --> VC-EVCC, Request: 0x610

VC-EVCC --> Tester, Response: 0x612

Tester --> Functional: 0x614

The following description contains an example of a Vector serial number and describes the conversion of the response code.

1. Read Vector Serial Number Information:
Request: 03 22 F1 8A FF FF FF FF
Response (First Frame):10 10 62 F1 8A 31 32 30
Request (Flow Control): 30 00 14 00 00 00 00 00
Response (Consecutive Frame): 21 32 30 37 2D 30 30 30
Response (Consecutive Frame): 22 30 30 36 FF FF FF FF
Complete Response: 62 F1 8A 31 32 30 32 30 37 2D 30 30 30 30 30 36

Note
In order to read the Vector serial number information correctly the transport protocol according to ISO 15765-2 [6] has to be implemented. In some cases, the response messages might include the value “AA” instead of “FF”.

The “Vector Serial Number Information” is included in 13 bytes. The service response is structured as follows: “XXXXXX-YYYYYY”

- “XXXXXX” equals the ECU identifier in ASCII representation (bytes 0…5)
- “-“ equals a separation value in ASCII representation (byte 6)
- “YYYYYY” equals a consecutive number in ASCII representation (bytes 7…12)

Response: 62 F1 8A 31 32 30 32 30 37 2D 30 30 30 30 30 36

31 32 30 32 30 37 (Hex) → 120207 (ASCII)
2D (Hex) → “-” (ASCII)
30 30 30 30 30 36 (Hex) → 000006 (ASCII)

In this example the Vector serial number is “120207-000006”.

5.2.1.4 Fault Memory

The VC-EVCC contains a fault memory which can be handled via UDS according to ISO 14229-1 [7]. The following services are supported by the VC-EVCC.

SID 0x19	Description
19 01	Fault Memory Read (Number)
19 02	Fault Memory Read (all identified)
19 06	Fault Memory Read (extended)
19 07	Fault Memory Report number of DTC by severity
19 08	Fault Memory Read DTC by severity
19 09	Fault Memory Read severity information
19 0A	Fault Memory Read (supported errors)

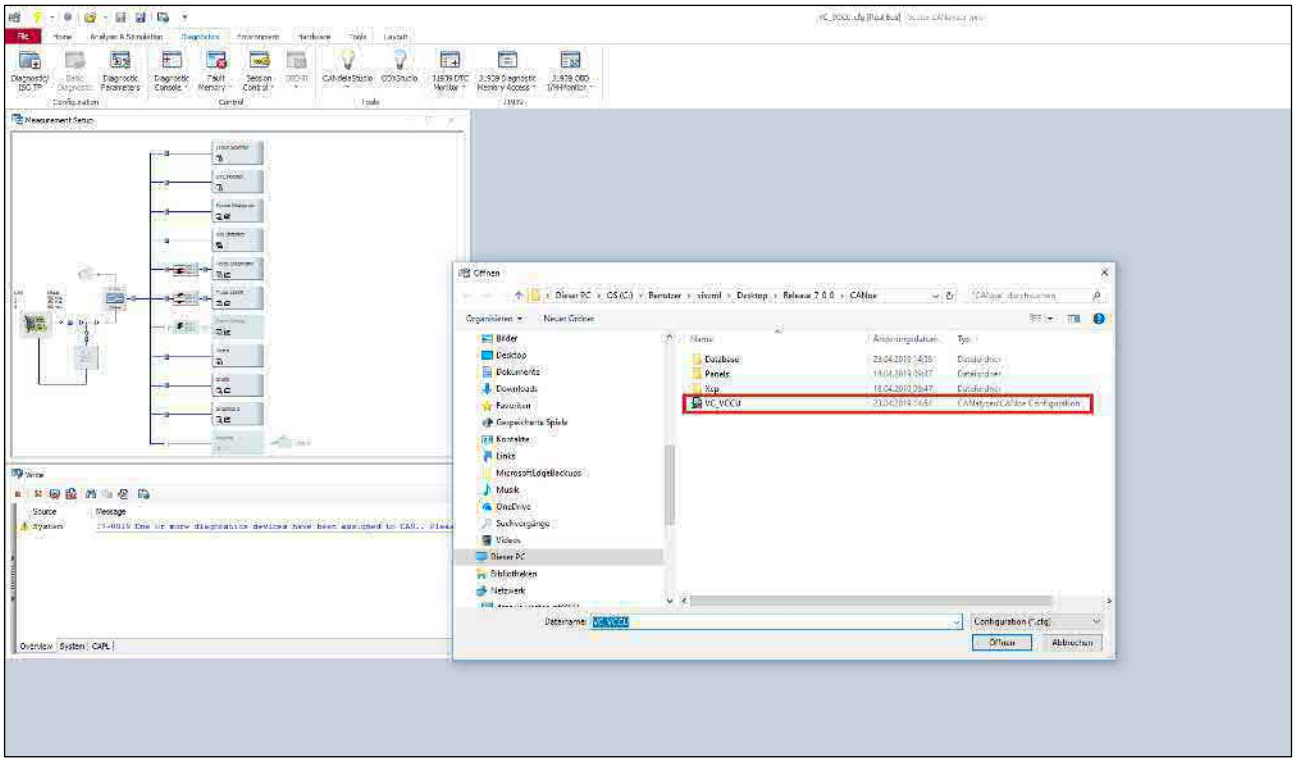
Table 5-11 Read DTC Information Service (0x19)

SID 0x14	Description
14	Fault Memory Clear (all errors)

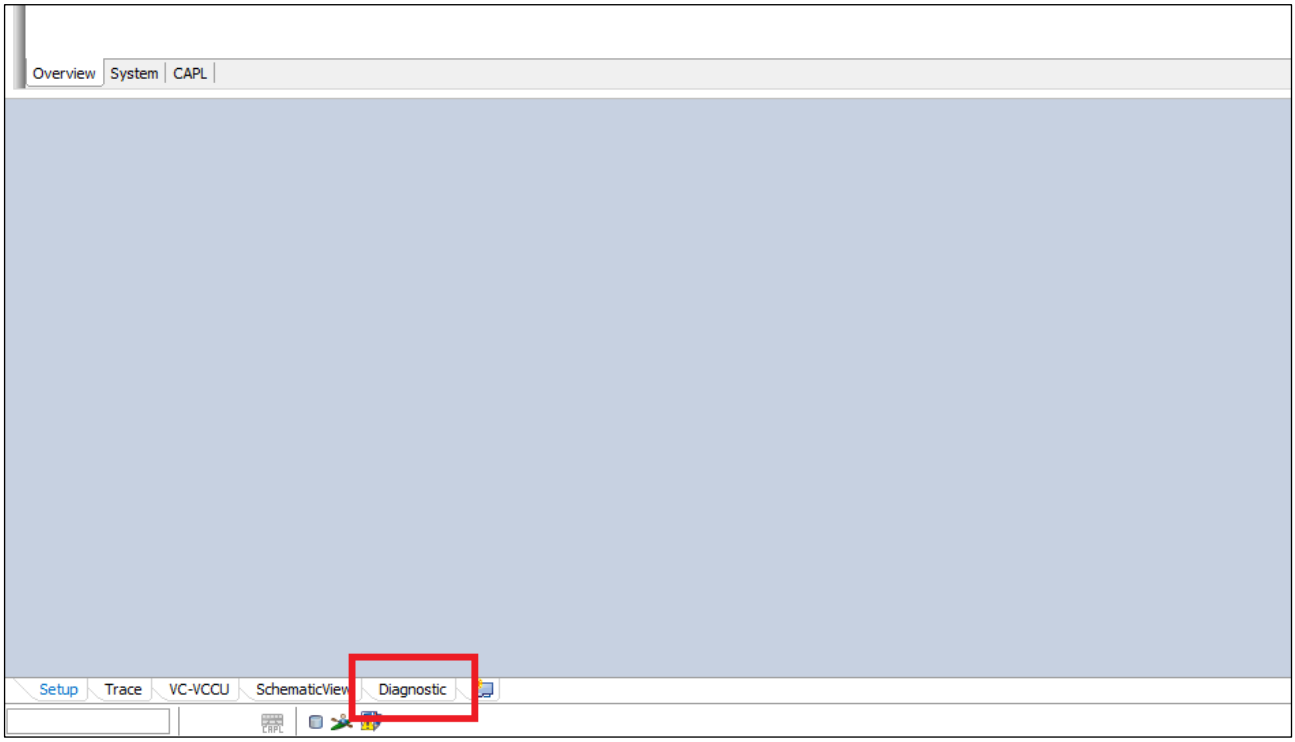
Table 5-12 Clear Diagnostic Information (0x14)

The following description explains the reading and clearing of the fault memory with CANoe/CANalyzer and the delivered CANoe/CANalyzer configuration.

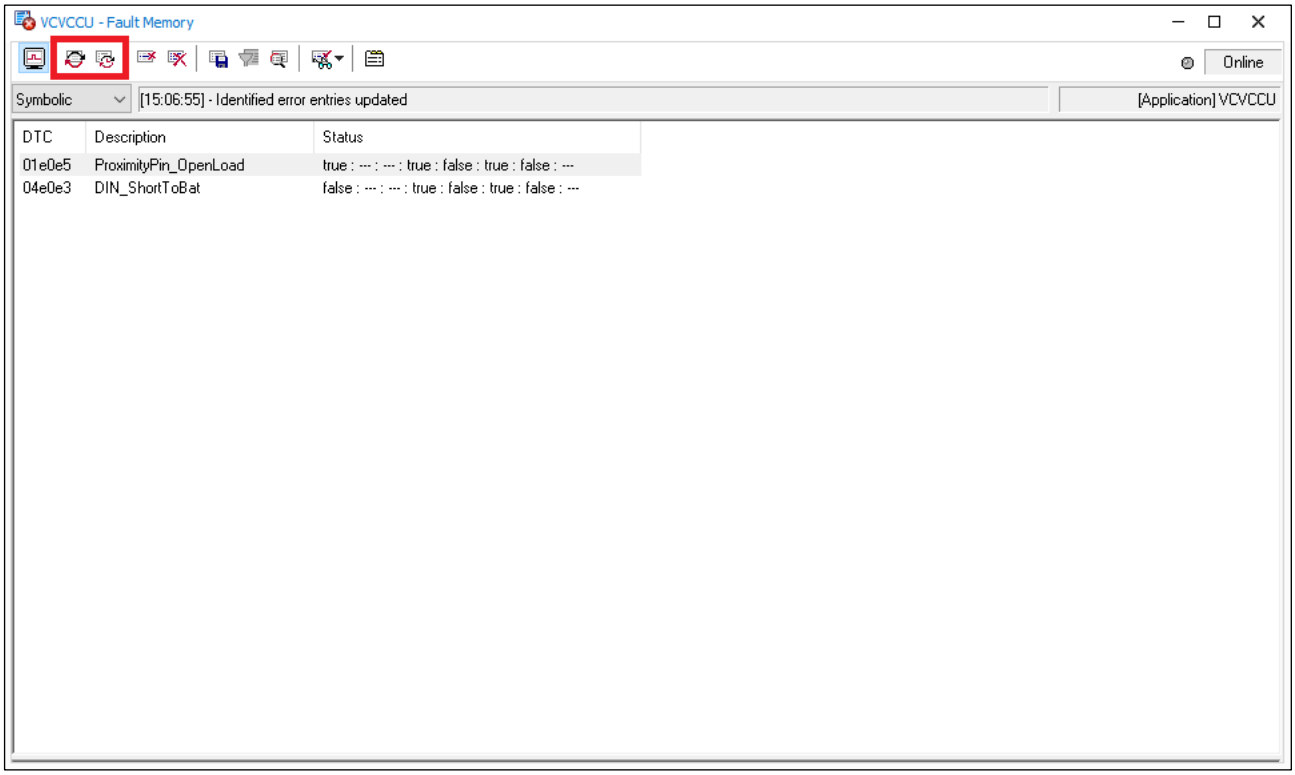
1. Start CANoe/CANalyzer and open the delivered CANoe/CANalyzer configuration “VC-EVCC”.



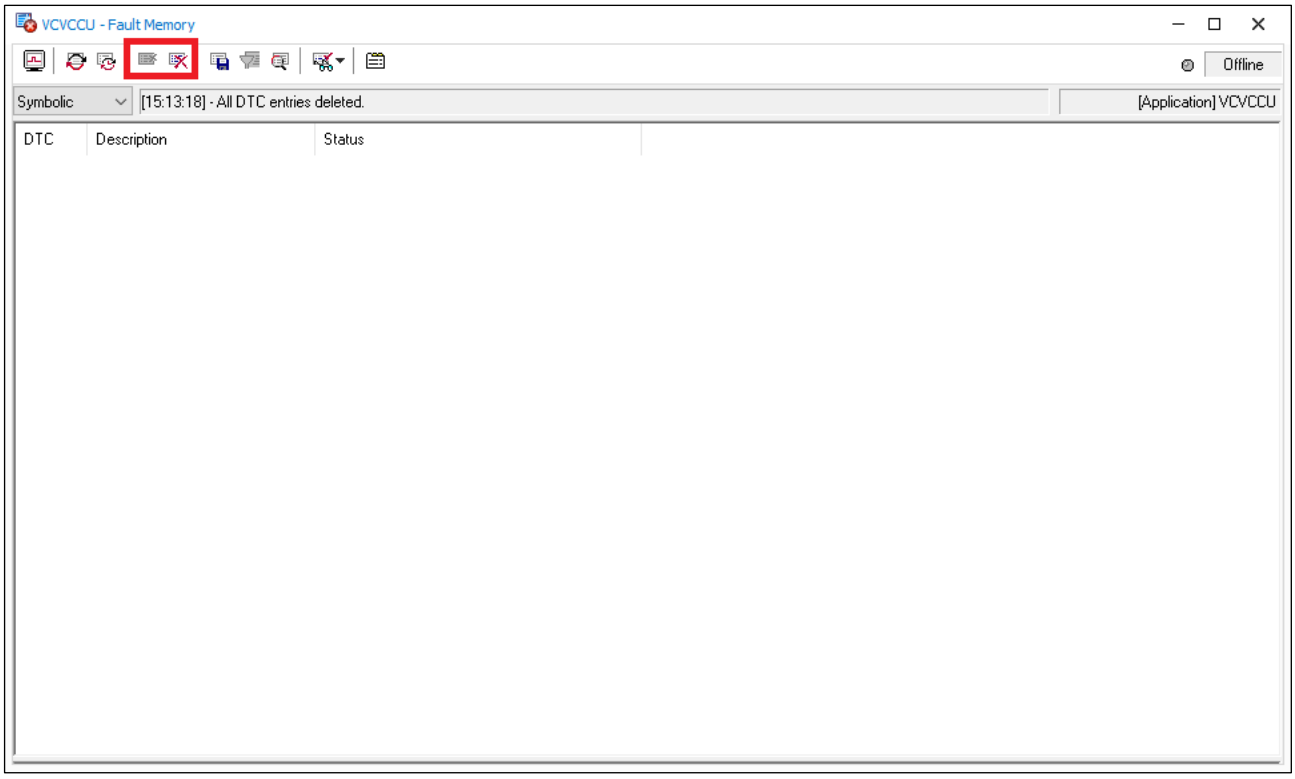
2. Select the desktop “Diagnostic”. The window “VCVCCU – Fault memory” provides functionalities to read and clear the fault memory.



3. Click on the button “Update fault memory list” in order to **read** the fault memory. It is also possible to update the fault memory list cyclically by using the button ”Activate cyclic update”. Please note that the measurement must be started to read the fault memory.



4. Click on the button “Delete all fault memory entries” in order to **clear** the fault memory. It is also possible to delete single fault memory entries by selecting a DTC and using the button “Delete DTC”. Please note that the measurement must be started to clear the fault memory.



5.2.2 Reflashing the VC-EVCC

Reflashing can only be executed by using the Vector flash tool “vFlash”. vFlash is required to install new software versions on the VC-EVCC. The flashing process with vFlash is described in this chapter. Since there are different versions of vFlash the following two vFlash Packs are provided.

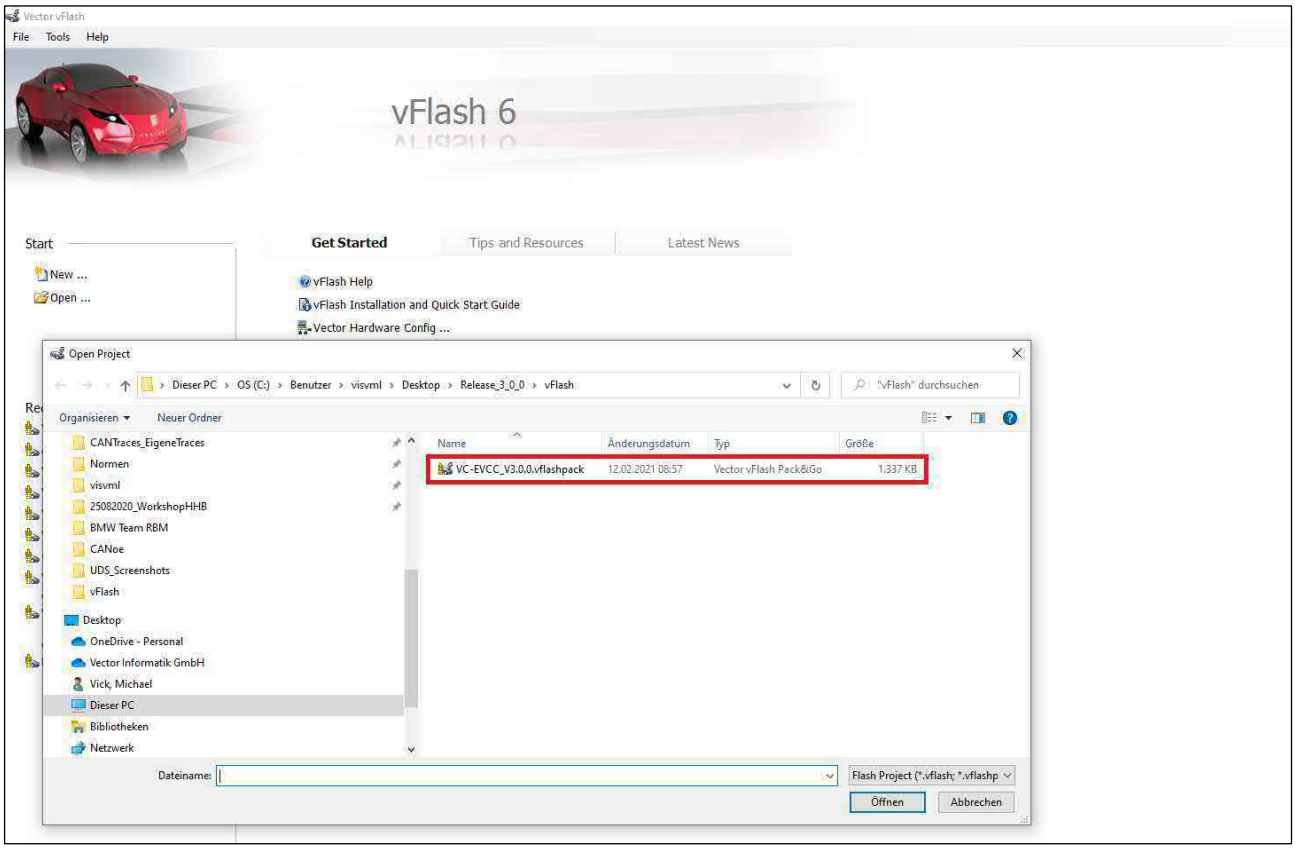
- VC-EVCC_Vx.x.x
- VC-EVCC_Vx.x.x_vFlash3.0

The vFlash Pack “VC-EVCC_Vx.x.x_vFlash3.0” is used for vFlash version 3.0 whereas the vFlash Pack “VC-EVCC_Vx.x.x” is used for newer vFlash versions than version 3.0.

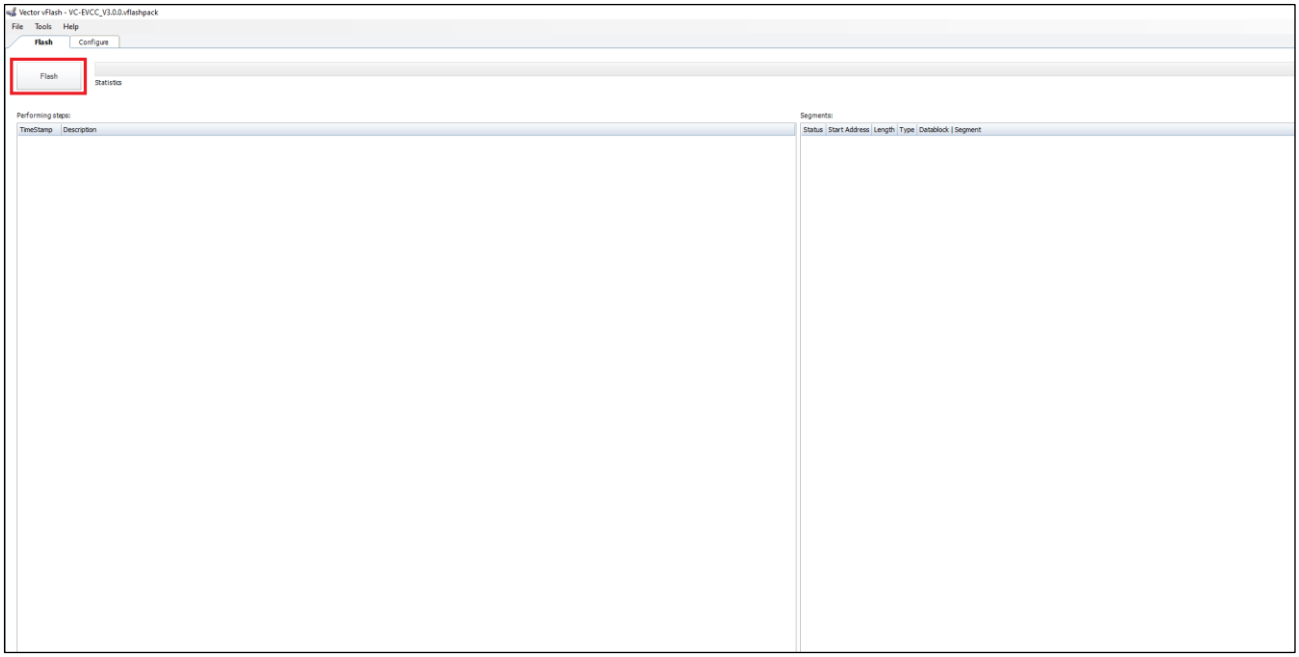
Note
In preparation for the flashing process the VC-EVCC must be connected to power supply. Furthermore, a Vector interface could be used as a CAN-Interface between Tester and VC-EVCC.

1. Start vFlash and click on the button “Open”.

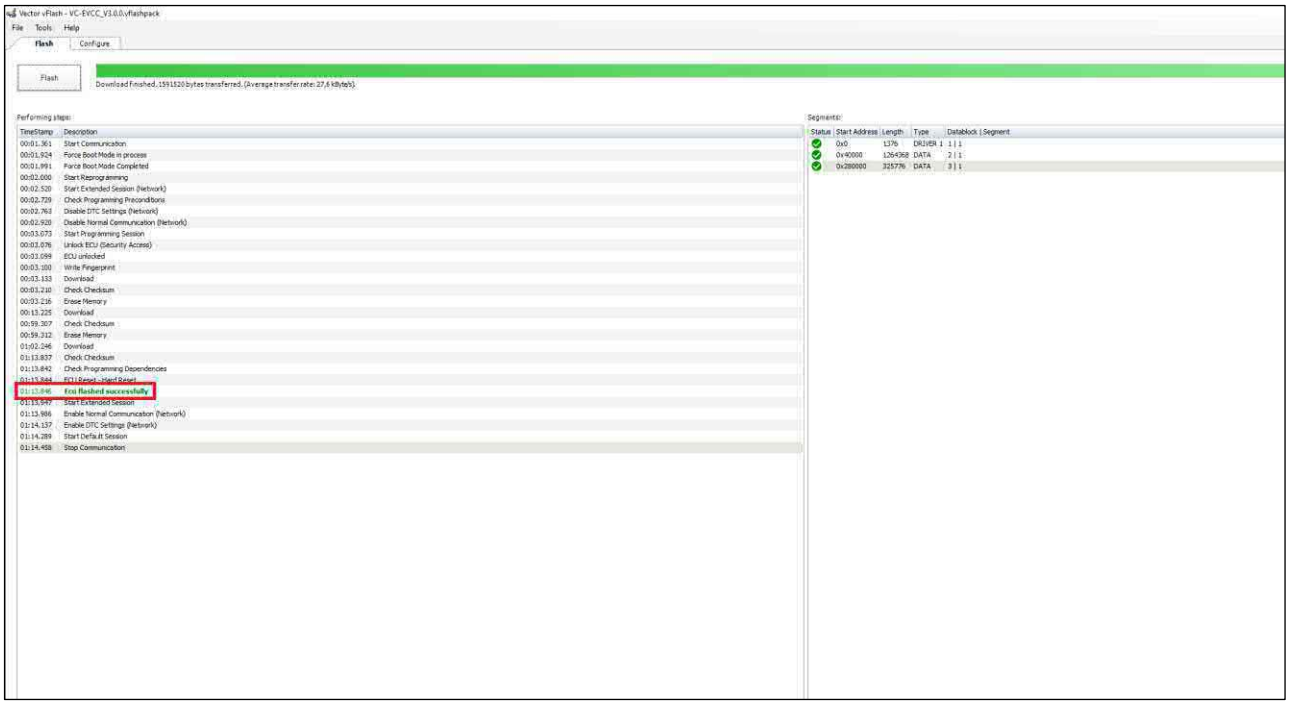
2. Open the requested flashpack according to the applied vFlash version.



3. Once the corresponding vFlash Pack is selected a new window is opened. Now start the flash process by clicking on the button “Flash”.



4. The green bar shows the progress of the flash process. As soon as the flash process is successfully finished the information “Ecu flashed successfully” is displayed in green.



5.3 Low Level Signal Evaluation & Control

5.3.1 Combo-Inlet

5.3.1.1 PlugPresent Evaluation

Note
PlugPresent and Proximity Pin is an alias to each other.

Signal	Description
PlugPresent_Status	The proximity pin connection state of the cable/plug
PlugPresent_Voltage	The voltage measured at the proximity pin
PlugPresent_Resistance	The cable resistance value
PlugPresent_Wakeup	The wakeup state of the proximity pin signal
PlugPresent_SelfDiagnosticStatus	The self-diagnostic state of the proximity pin signal

Table 5-13 Proximity Pin Evaluation Signals

Functionality

Via the proximity pin the ECU starts from sleep mode if a cable is connected.

The VC-EVCC detects the wakeup caused by the proximity pin in the first 75ms after the wakeup event. If the ECU is already running it cyclically checks if an inlet is connected (PlugPresent_Wakeup).

Combo2 Inlet

The VC-EVCC interprets the measured voltage (PlugPresent_Voltage) to detect if a cable is connected (PlugPresent_Status).

Caution
If the value of the internal resistor between PP and PE is configured to 4,7 kOhm, the VC-EVCC will consider a Combo2 inlet connected and calculate the plug present voltage accordingly.

If a cable is connected the VC-EVCC determines the cable resistance value (PlugPresent_Resistance) from the measured voltage. Possible detectable resistance values which represent different cable types capable of different charging currents are:

PlugPresent Voltage	PlugPresent Status	Protective Earth Offset
1,15 V	Connected (100 Ohm)	-0,77 V … +2,1 V
1,9 V	Connected (220 Ohm)	-1,58 V … +2,1 V
3,2 V	Connected (680 Ohm)	-2,1 V … +2,1 V
3,85 V	Connected (1500 Ohm)	-2,1 V … +2,1 V
4,65 V	Not connected	-2,1 V … +2,1 V

Table 5-14 PlugPresent Voltage Levels Combo2

Note
The values of the Plug Present Voltage are no real measured values. They are just the mean of the defined voltage range. A real calculation of the voltage value in software is too complex.

If no cable is connected the CAN signal for the internal PlugPresent_Resistance signal is set to not available.

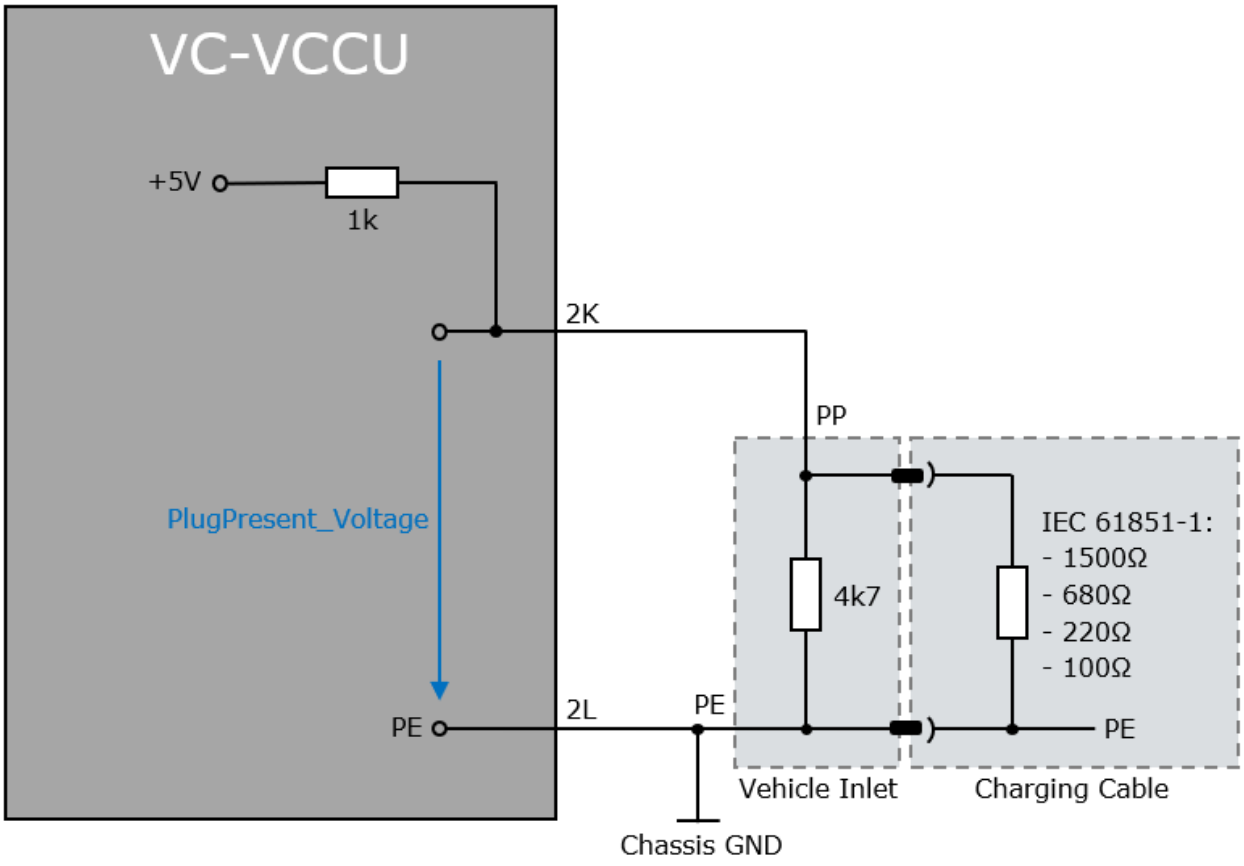


Figure 5-1: Electrical Circuit Proximity Pin Combo2 Inlet

Combo1 Inlet

The VC-EVCC interprets the measured voltage (PlugPresent_Voltage) to detect if a cable is connected (PlugPresent_Status).

Caution
If the value of the internal resistor between PP and PE is configured to 2,7 kOhm, the VC-EVCC will consider a Combo1 inlet connected and calculate the plug present voltage accordingly.

The Combo1 plug has a built-in switch. If the plug is connected the VC-EVCC determines the status of the switch from the measured voltage. It is made available on the CAN Signal S3Switch_Status to be communicated on CAN1.

PlugPresent Voltage	PlugPresent Status	S3 Switch Status	Protective Earth Offset
1,5 V	Connected	Not pressed	-1,06 V … +2,1 V
2,75 V	Connected	Pressed	-2,1 V … +2,1 V
4,4 V	Not Connected	Not available	-2,1 V … +2,1 V

Table 5-15 PlugPresent Voltage Levels and S3 Switch Status Combo1

If AC charging with LIN communication according to SAE J3068 is activated the plug present evaluation is performed as follows.

PlugPresent Voltage	PlugPresent Status	S3 Switch Status	Protective Earth Offset
1,1 V	Connected (100 Ohm)	Not available	-0,77 V … +2,1 V
1,5 V	Connected	Not pressed	-1,06 V … +2,1 V
1,9 V	Connected (220 Ohm)	Not available	-1,58 V … +2,1 V
2,75 V	Connected	Pressed	-2,1 V … +2,1 V
3,1 V	Connected (680 Ohm)	Not available	-2,1 V … +2,1 V
3,7 V	Connected (1500 Ohm)	Not available	-2,1 V … +2,1 V
4,4 V	Not Connected	Not available	-2,1 V … +2,1 V

Table 5-16 PlugPresent Voltage Levels and S3 Switch Status Combo 1 with Activated LIN Charging

Note
The values of the Plug Present Voltage are no real measured values. They are just the mean of the defined voltage range. A real calculation of the voltage value in software is too complex.

Combo1 does not support the PlugPresent Resistance, therefore the signal PlugPresent_Resistance is set to SNA.

If the CAN Signal PlugPresent_SelfDiagnosticStatus has any fault value, the signal S3Switch_Status is set to Error.

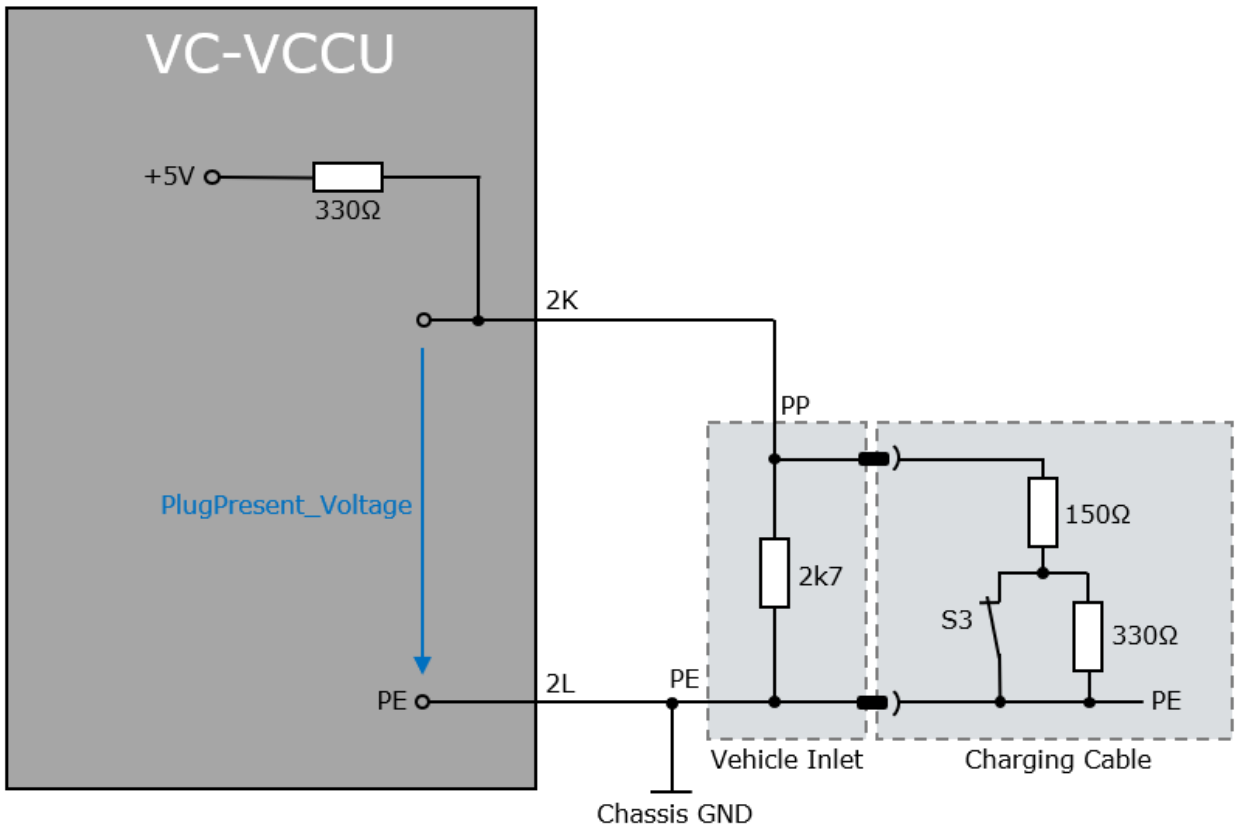


Figure 5-2: Electrical Circuit Proximity Pin Combo1 Inlet

Self-Diagnostics

The VC-EVCC cyclically polls for electrical faults at the proximity pin.

If PlugPresent_Voltage is in one of the valid ranges for normal operation PlugPresent_SelfDiagnosticStatus is set to OK.

Also, the CAN signals of PlugPresent_Wakeup and PlugPresent_Status are set to error value if a fault is detected.

If the measured resistance is not in any of the valid ranges for normal operation or known electrical faults the CAN signals of the respective internal signals are set to value not available.

- PlugPresent_Status
- PlugPresent_Resistance
- PlugPresent_Wakeup
- PlugPresent_SelfDiagnosticStatus

5.3.1.2 Control Pilot Evaluation

The control pilot signal is a low-level communication between the charging infrastructure and the VC-EVCC based on the voltage level, the duty cycle and the period of the Control Pilot signal.

Signal	Description
ControlPilot_Frequency	The period of the control pilot signal
ControlPilot_DutyCycle	The duty cycle of the control pilot signal
ControlPilot_Voltage	The voltage level of the control pilot signal
ControlPilot_Wakeup	The wakeup state of the control pilot signal
ControlPilot_ChargeMode	The requested control pilot charge mode (via CAN)

Table 5-17 Control Pilot Evaluation Signals

Functionality

The VC-EVCC detects a wakeup on the control pilot line in the first 75ms after the wakeup event and sets the signal ControlPilot_Wakeup.

Frequency, duty cycle and voltage level are measured or set to a specific value according to the following logic. Also, the state of the control pilot communication is set.

If the measured frequency (ControlPilot_Frequency) is within the range of 800Hz - 1200Hz the Control Pilot communication may be ready (active). If the measured frequency is outside this range the communication is not ready (inactive).

> If the communication is ready the VC-EVCC measures the duty cycle (ControlPilot_DutyCycle) of the signal.

> If the communication is not ready or the measured frequency is 0Hz ControlPilot_DutyCycle is set to signal not available.

> If the communication is ready or the frequency is 0 Hz the voltage level ControlPilot_Voltage of the control pilot signal is measured.

> If the communication is not ready and the frequency is > 0 Hz the ControlPilot_Voltage is set to signal not available.

Self-Diagnostic

The hardware circuit of the VC-EVCC supports to detect a short to battery fault at the control pilot pin.

If the control pilot frequency is 0 Hz and the voltage is in its defined range for short to battery detection the VC-EVCC sets the duty cycle signal and the frequency signal to error value

5.3.1.3 Protective Earth

The VC-EVCC measures the Protective Earth (PE) to GND offset voltage at the microcontroller pins. If the offset voltage exceeds the respective minimum or maximum limit the VC-EVCC will raise the following diagnostic trouble code.

- Protective Earth (PE) to GND offset out of range (DTC 0x2BE0E2)

5.3.1.4 Plug Locking

Signal	Description
PlugLock_MotorStatus	The motor drive status
PlugLock_SelfDiagnosticStatusOutput0	The self-diagnostic status of the full bridge output 0
PlugLock_SelfDiagnosticStatusOutput1	The self-diagnostic status of the full bridge output 1

Table 5-18 Plug Locking Signals

Functionality

The VC-EVCC provides a full bridge solution to control a DC motor. It controls the movement and the direction of a connected motor and detects electrical faults by reading the voltage and current levels of the full bridge. The signals and their CAN representatives are for debugging purposes.

The automatic plug locking is described in the following chapters.

Self-Diagnostic

The electrical faults of the full bridge outputs are detected during movement and also without output activation.

The VC-EVCC measures the voltage of the full bridge outputs (PlugLock_VoltageOutput0, PlugLock_VoltageOutput1) cyclically.

If a movement of the motor is requested the detection of an electrical fault of a full bridge output depends on the direction.

If an error is detected the signal PlugLock_MotorStatus is set to error value. The type of the error is stored in the signal PlugLock_SelfDiagnosticStatusOutput0 or the signal PlugLock_SelfDiagnosticStatusOutput1 respectively.

5.3.1.5 Lock Position Evaluation

Signal	Description
POSFeedback_Voltage	The position feedback voltage value
POSFeedback_SelfDiagnosticStatus	The position feedback self-diagnostic status

Table 5-19 Lock Position Evaluation Signals

Functionality

The VC-EVCC detects the position of the inlet lock via the position feedback pin. This is done via a resistor coded switch. The measured voltage is stored in the signal POSFeedback_Voltage.

Self-Diagnostic

If POSFeedback_Voltage is in one of the valid ranges for normal operation POSFeedback_SelfDiagnosticStatus is set to ok.

If POSFeedback_Voltage is in one of the ranges of an electrical fault its type is stored in the signal POSFeedback_SelfDiagnosticStatus.

If POSFeedback_SelfDiagnosticStatus has any fault value, POSFeedback_Voltage is set to error.

If POSFeedback_Voltage isn't in any of the valid ranges for normal operation or electrical faults, POSFeedback_Voltage and POSFeedback_SelfDiagnosticStatus are set to not available.

If the sensor supply voltage is outside the valid range the VC-EVCC sets the POSFeedback_Voltage and POSFeedback_SelfDiagnosticStatus to signal not available.

5.3.2 Inputs

5.3.2.1 Digital Input (Charging Stop Switch)

Signal	Description
DigitalInput_Status	The digital input value
DigitalInput_SelfDiagnosticStatus	The digital input self-diagnostic status
DigitalInput_Wakeup	The digital input wakeup status

Table 5-20 Digital Input Signals

Functionality

The Charging process can be directly stopped by pressing a connected button. Also, the VC-EVCC wakes up when the button is pressed. The wakeup is recognized within 75ms.

Self-diagnostic

If a short-to-battery is detected the signal DigitalInput_Status is set to error value.

Note
The self-diagnostic is only performed when the button is not pressed.

5.3.2.2 S3 Switch on Combo 1

Signal	Description
S3Switch_Status	Status of the S3 Switch

Table 5-21 Combo 1 Digital Input Signals

Functionality

The charging process can be directly stopped by pressing the switch on the charging gun.

Note
The S3 switch is realized in software and is made available through the PlugPresent pin on the VC-EVCC and therefore does not require any hard wire.

Self-Diagnostic

If any fault value is detected in the signal PlugPresent_SelfDiagnosticStatus, the signal S3Switch_Status is set to error.

5.3.2.3 Digital Input (Generic Switch)

One high side output of the VC-EVCC is implemented to work as an input.

Signal	Description
HighSideOut2_Input_Status	The HSOUT2 input value

Table 5-22 Analog Inputs Signals

The following table shows the implemented hysteresis for the detection of a pressed button event.

Input voltage level	HighsideOut2_InputStatus
≥ 4500 mV	pressed
≤ 3500 mV	not pressed
≥ 3500 mV ≤ 4500 mV	Remain present value
Initial value	Signal not available

Table 5-23 Button Hysteresis

Note
Self-diagnostics is not supported for this input.

5.3.2.4 Terminal 15 Signal Input

Signal	Description
HighSideOut3_Input_Status	The high side out 3 input value:
HighSideOut3_Input_Wakeup	The high side out 3 wakeup status

Table 5-24 Terminal 15 Input Signals

The following table shows the implemented hysteresis for Terminal 15 signal Input.

Input voltage level	HighsideOut3_InputStatus
≥ 4500 mV	Pressed (active)
≤ 3500 mV	not pressed (inactive)
≥ 3500 mV ≤ 4500 mV	Remain present value
Initial value	Signal not available

Table 5-25 Terminal 15 Signal Hysteresis

If the Terminal 15 signal input is the source for a wakeup event the information is stored in the signal HighSideOut3_Input_Wakeup.

Note
Self-diagnostics is not supported for this input.

5.3.2.5 Temperature Measurement

Signal	Description
PTC0_Raw	The PTC0 ADC (12 bit) raw value
PTC1_Raw	The PTC1 ADC (12 bit) raw value
PTC2_Raw	The PTC2 ADC (12 bit) raw value
PTC0_Resistance	The PTC0 resistance value
PTC1_Resistance	The PTC1 resistance value
PTC2_Resistance	The PTC2 resistance value
PTC0_SelfDiagnosticStatus	The PTC0 self-diagnostic status
PTC1_SelfDiagnosticStatus	The PTC1 self-diagnostic status
PTC2_SelfDiagnosticStatus	The PTC2 self-diagnostic status

Table 5-26 Temperature Measurement Signals

Functionality

Three connected temperature sensors are measured cyclically. The internal measured values are stored in the signals:

- PTC0_Raw / PTC0_Resistance
- PTC1_Raw / PTC1_Resistance
- PTC2_Raw / PTC2_Resistance

Self-diagnostic

Detected electrical faults are stored in the signal representing the affected channel

- PTC0_SelfDiagnosticStatus
- PTC1_SelfDiagnosticStatus
- PTC2_SelfDiagnosticStatus

5.3.2.6 Hardware Version Coding

The VC-EVCC contains an internal hardware version coding for hardware generation 1.5. If the hardware version coding is not correct the VC-EVCC will raise the following diagnostic trouble code.

- Hardware Software Incompatibility (DTC 0x40E0E2)

Caution
The software of the VC-EVCC cannot be used with the hardware of the VC-VCCU or the VC-EVCC-P.

5.3.3 Outputs

5.3.3.1 LED Control

Signal	Description
VCVCCU_LED0_Request	The LED0 duty cycle percentage
VCVCCU_LED1_Request	The LED1 duty cycle percentage
VCVCCU_LED2_Request	The LED2 duty cycle percentage
VCVCCU_LED0_SelfDiagnosticStatus	The LED0 self-diagnostic status
VCVCCU_LED1_SelfDiagnosticStatus	The LED1 self-diagnostic status
VCVCCU_LED2_SelfDiagnosticStatus	The LED2 self-diagnostic status

Table 5-27 LED Outputs Signals

Functionality

The LED outputs can be controlled by setting the following signals via CAN, VCVCCU_LED0_Request, VCVCCU_LED1_Request and VCVCCU_LED2_Request. If one of the signals is not available, the respective LED output is not controlled.

Self-Diagnostic

Electrical faults are stored in the following signals representing the three different outputs:

- LED0_SelfDiagnosticStatus
- LED1_SelfDiagnosticStatus
- LED2_SelfDiagnosticStatus

5.3.3.2 High Side Output Control

Signal	Description
VCVCCU_HighSideOut0_Request	The HighSideOut0 output value
VCVCCU_HighSideOut1_Request	The HighSideOut1 output value
VCVCCU_HighSideOut2_Request	The HighSideOut2 output value
VCVCCU_HighSideOut3_Request	The HighSideOut3 output value
VCVCCU_HighSideOut4_Request	The HighSideOut4 output value
VCVCCU_HighSideOut0_SelfDiagnosticStatus	The HighSideOut0 self-diagnostic status
VCVCCU_HighSideOut1_SelfDiagnosticStatus	The HighSideOut1 self-diagnostic status
VCVCCU_HighSideOut2_SelfDiagnosticStatus	The HighSideOut2 self-diagnostic status
VCVCCU_HighSideOut3_SelfDiagnosticStatus	The HighSideOut3 self-diagnostic status
VCVCCU_HighSideOut4_SelfDiagnosticStatus	The HighSideOut4 self-diagnostic status

Table 5-28 High Side Outputs Signals

Functionality

The VC-EVCC provides three general purpose high side outputs which can be controlled via CAN signals. The high side outputs are set cyclically by the corresponding signal:

- VCVCCU_HighSideOut0_Request
- VCVCCU_HighSideOut1_Request
- VCVCCU_HighSideOut4_Request

If a signal is not available, the corresponding output is not controlled.

Self-Diagnostic

Electrical faults are stored in the diagnostic status signals of the outputs.

- VCVCCU_HighSideOut0_SelfDiagnosticStatus
- VCVCCU_HighSideOut1_SelfDiagnosticStatus
- VCVCCU_HighSideOut4_SelfDiagnosticStatus

Caution
If the High Side Outputs of the VC-EVCC are used, measures must be taken to ensure a load current greater than 15mA (HSOUT0, HSOUT1) respectively 330mA (HSOUT4).

An appropriate load resistor must be calculated depending on the supply voltage. Otherwise, the VC-EVCC will detect an OpenLoad error which leads to a switch-off of the respective High Side Output.

If in doubt, please contact the Vector support.

In ON state a short to GND and an open load can be detected. A short to battery situation will be detected as an open load.

In OFF state a short to GND, a short to battery and an open load could be detected depending on the off-state diagnostic configuration. If active off-state diagnostic is configured as “On” the VC-EVCC will detect a short to GND and an open load error even if the corresponding HSOUT is disabled.

5.4 ECU Control

5.4.1 ECU Control

Signal	Description
EcuControl_AwakeDiagActv	The UDS diagnostic session state
EcuControl_AwakeECU	The ECU awake state

Table 5-29: ECU Control Signals

Functionality

If the current UDS diagnostic session is not default the signal EcuControl_AwakeDiagActv is set to active.

The signal EcuControl_AwakeECU is set to active if

- DiagnosticCAN_State is active or
- J1939CAN_State is active

5.4.2 Real-Time Clock

Signal	Description
RTC_TimerValue	The real-time clock timer start value in minutes
RTC_TimerRequest	The real-time clock timer start trigger
RTC_Wakeup	The real-time clock wakeup state
RTC_TimerStatus	The real-time clock timer state

Table 5-30 Real-time Clock Signals

Functionality

A real-time clock, which supports to notify or wakeup the microcontroller after a defined time or at a defined time, can be programmed via CAN.

If the signal RTC_TimerRequest is active and the signal RTC_TimerValue is > 0, a timer is started and the signal RTC_TimerStatus is set to “running”.

Note
While RTC_TimerRequest is active the timer is set and started only once. The real time clock functionality is deactivated once charging schedules are used.

If the signal RTC_TimerRequest is active and the signal RTC_TimerValue is 0, the timer is stopped and the signal RTC_TimerStatus is set to “stopped”.

If the set time has elapsed, the signal RTC_TimerStatus is set to “elapsed”.

A wakeup caused by the real-time clock is stored in the signal RTC_Wakeup.

5.5 Charging Control

5.5.1 Plug Detection

Signal	Description
Inlet_ConnectionStatus	The inlet/cable connection status
Inlet_MaxCurrent	The maximum charging current given by the cable

Table 5-31 Plug Detection Signals

Parameter	Value
Inlet_PlugDetectionTime	2000ms

Table 5-32 Plug Detection Parameters

Functionality

If the plug is recognized as connected (PlugPresent_Status) for the plug detection time (Inlet_PlugDetectionTime) the inlet is regarded as plugged and the maximum charging current (Inlet_CableMaxCurrent) according to the derived cable resistance is chosen (Table B.3 in [4]).

If the derived Plug Present resistance is not available or is set to error, the maximum cable charging current is set to signal not available.

5.5.2 Plug Locking

Signal	Description
Vehicle_PlugLockAllowed	The permission from the vehicle to lock the plug
Vehicle_PlugUnlockAllowed	the permission from the vehicle to unlock the plug
Inlet_UnlockedTime	The time where a new plug lock is prevented after an unlock
DigitalInput_MinPressTime	The minimum detection time of the press event at the digital input
Inlet_MotorStatus	The position and status of the lock/unlock mechanism of the plug

Inlet_OverloadTimeoutTime	The VC-EVCC time to pause the movement to protect the inlet motor against over heating
Inlet_OverloadProtection	The Status of the overload protection of the plug motor
Inlet_MaxMovementTime	The maximum time to activate the motor for movement

Table 5-33 Plug Locking Signals

Parameter	Value
Inlet_MaxMovementTime	600ms (default)
Inlet_OverloadTimeoutTime	2650ms (default)
Inlet_UnlockedTime	5000ms

Table 5-34 Plug Locking Parameters

Note
The parameters “Inlet_MaxMovementTime” and “Inlet_OverloadTimeoutTime” are configurable via UDS. For more information please refer to the chapter “UDS communication”.

Functionality

The VC-EVCC sets the state of the signal VCVCCU_Inlet_MotorStatus according to the following table.

VCVCCU_POSFeedback_Voltage	VCVCCU_Inlet_MotorStatus
480mV – 680mV and no latch movement	Unlocked
480mV – 680mV or 2510mV – 3210mV and latch movement is ongoing	Moving
2510mV – 3210mV and no latch movement	Locked
Error or out of valid voltage range	Error

Table 5-35 Inlet Locking Interpretation

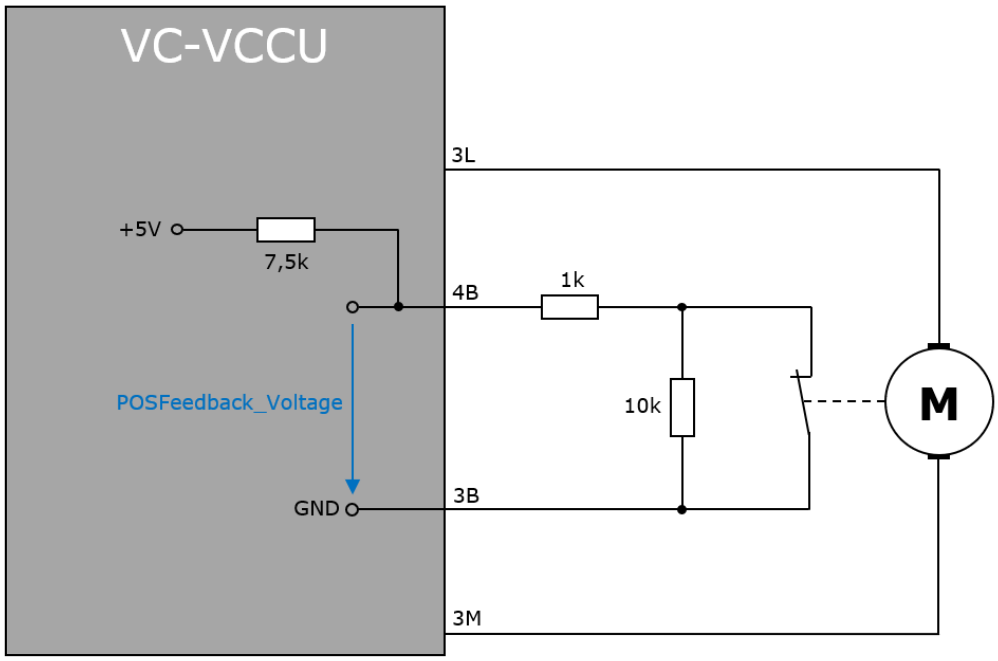


Figure 5-3: Electrical Circuit Position Feedback Evaluation

The following table gives an overview of the plug locking considering different start and end positions.

Situation	Start position	Movement	End position
Lock-A	Bolt is in the no locking position	Lock movement	Bolt is in the locked position
Lock-B	Bolt is in the no locking position	Lock movement	Bolt is in the no locking position
Lock-C	Bolt is in the no locking position	Lock movement	Bolt is in the failed locking position
Lock-D	The bolt is in the failed locking position	Lock movement	Bolt is in the failed locking position
Lock-E	The bolt is in the locked position	Lock movement (ignored)	Bolt is in the locked position

Table 5-36 Plug Locking Considerations

The VC-EVCC starts to lock the plug (set PlugLock_MotorDrive to direction which closes the plug) if all following conditions are fulfilled:

- Inlet_ConnectionStatus is active
- Inlet_UnlockedTime has elapsed
- Vehicle_PlugLockAllowed is set
- Inlet_MotorStatus is unlocked
- PlugLock_MotorStatus is not error

The lock movement is stopped if the Inlet_MaxMovementTime has elapsed or the PlugLock_MotorStatus is error.

When the lock movement is stopped a timer (Inlet_OverloadTimeoutTime) for overload protection is set, during which no motor movement is possible.

If the lock movement stops and the Inlet_MotorStatus is not locked, an unlock trigger is set.

The timer to ensure a minimum pause (Inlet_UnlockedTime) between an unlocking and the next locking movement is started also when a lock movement was stopped but the Inlet_MotorStatus is not locked.

The following table gives an overview of the plug unlocking considering different start and end positions.

Situation	Start position	Movement	End position
Unlock-A	Bolt is in the no locking position	Unlock movement	Bolt is in the no locking position
Unlock-B	Bolt is in the locked position	Unlock movement	Bolt is in the no locking position
Unlock-C	Bolt is in the locked position	Unlock movement	Bolt is in the locked position
Unlock-D	Bolt is in the failed locking position	Unlock movement	Bolt is in the locked position
Unlock-E	Bolt is in the failed locking position	Unlock movement	Bolt is in the failed locking position
Unlock-F	Bolt is in the failed locking position	Unlock movement	Bolt is in the no locking position

Table 5-37 Plug Unlocking Considerations

5.5.3 Plug Unlocking

Caution
To avoid personal injuries and damage to property, the vehicle must check the contactor voltage before the unlock permission is set to "Allowed".

If charging is stopped due to either digital input or S3 switch or StopCharge CAN signal, the VC-EVCC will not monitor whether the contactor voltage has dropped below 60V.

The VC-EVCC start to unlock the plug (set PlugLock_MotorDrive to direction which opens the plug) if

- VCVCCU_ChargeUnit_State is not StateC and
- VCVCCU_ChargeUnit_State is not StateD and
- VCVCCU_Vehicle_PlugUnlockPermission is allowed and
- VCVCCU_PlugLock_MotorStatus is not error and
- Inlet_OverloadProtection is not active

and either

- VCVCCU_DigitalInput_DebouncedStatus is pressed or
- VCVCCU_S3Switch_DeboundedStatus is pressed (only in case of Combo1) or
- VCVCCU_Vehicle_StopCharge is pressed (only if feature is activated) or
- unlock movement trigger from an unsuccessful lock movement is set

The unlock movement is stopped if the Inlet_MaxMovementTime has elapsed or the PlugLock_MotorStatus is error.

To prevent a locking movement directly after the unlock movement has stopped a timer (with Inlet_UnlockedTime), during which no lock movement is allowed, is started.

When the unlock movement is stopped a timer (Inlet_OverloadTimeoutTime) for overload protection is set, during which no motor movement is possible.

5.5.4 Control Pilot Handling

Signal	Description
VCVCCU_ChargeUnit_State	The state of control pilot signal
VCVCCU_ChargeUnit_Mode	The charge unit mode derived from the control pilot duty cycle
VCVCCU_ChargeUnit_MaxCurrent	The maximum allowed current derived from the control pilot duty cycle

Table 5-38 Control Pilot Handling Signals

Functionality

The ControlPilot_Status is dependent on the measured ControlPilot_Voltage and set according to table A.3 in [4].

ControlPilot_Voltage	ControlPilot_Status
-1V <= ControlPilot_Voltage <= 1V and PlugPresent_Status is not connected	StatusA
8V <= ControlPilot_Voltage <= 10V and charge communication is not active	StatusB1
8V <= ControlPilot_Voltage <= 10V and charge communication is active	StatusB2
5V <= ControlPilot_Voltage <= 7V	StatusC
2V <= ControlPilot_Voltage <= 4V	StatusD
-1V <= ControlPilot_Voltage <= 1V and PlugPresent_Status is connected.	StatusE
-13V <= ControlPilot_Voltage <= -11V	StatusF
See below	Not available

Table 5-39 Setting of the Control Pilot Status

The ControlPilot_Status is set to not available if ControlPilot_Voltage is in one of the following ranges (according to table A.3):

- 10V < ControlPilot_Voltage

- 7V < ControlPilot_Voltage < 8V
- 4V < ControlPilot_Voltage < 5V
- 1V < ControlPilot_Voltage < 2V
- -11V < ControlPilot_Voltage < -1V
- -13V > ControlPilot_Voltage

Caution
The Protective Earth to GND offset must be within a range from -2,1V to 2,1V in order to detect the Control Pilot Status reliably.

VCVCCU_ChargeUnit_State	Control Pilot_PresentStatus
StateB2, StateC or StateD.	Active
StateA, StateB1 or StateE.	Not active
StateF or not available	Not available

Table 5-40 Control Pilot Status

The signal VCVCCU_ChargeUnit_Mode is set to ChargeV2G if

- ControlPilot_PresentStatus is active and
- 3% <= ControlPilot_DutyCycle <= 7%.

The signal VCVCCU_ChargeUnit_Mode is set to ChargePwm if

- ControlPilot_PresentStatus is active and
- 8% <= ControlPilot_DutyCycle <= 97%.

The signal VCVCCU_ChargeUnit_Mode is set to ChargeLIN if

- ControlPilot_Voltage equals 6V or 9V (tolerance ±1V) and
- LIN frame SeInfoList has been detected by the LIN transceiver

The signal VCVCCU_ChargeUnit_Mode is set to ChargingNotAllowed if ControlPilot_PresentStatus is active and

- 0% < ControlPilot_DutyCycle < 3% or
- 7% < ControlPilot_DutyCycle < 8% or
- ControlPilot_DutyCycle > 97%

The signal VCVCCU_ChargeUnit_Mode is set to signal not available if

- ControlPilot_PresentStatus is not active or
- ControlPilot_PresentStatus is not available or
- ControlPilot_DutyCycle is set to signal not available.

If the signal VCVCCU_ChargeUnit_Mode is ChargePwm the ChargeUnit_MaxCurrent is derived from ControlPilot_DutyCycle (according to table A.6 in [4]).

If the signal VCVCCU_ChargeUnit_Mode is not ChargePwm the ChargeUnit_MaxCurrent is set to signal not available.

Note
The ChargeUnit_MaxCurrent is calculated with a deviation of ±1A.

5.5.5 Digital Input Control

Signal	Description
DigitalInput_DebouncedStatus	The debounced status of the digital input (charging stop switch)
DigitalInput_MinPressTime	The minimum time for a valid digital input press event
HighSideOut2_Input_DebouncedStatus	The debounced status of the generic switch input
HighSideOut3_Input_DebouncedStatus	The debounced status of the Terminal 15 signal input
S3Switch_DebouncedStatus	The debounced status of the switch on the gun for Combo1

Table 5-41 Digital Input Control Signals

Parameter	Value
DigitalInput_MinPressTime	30ms

Table 5-42 Digital Input Control Parameters

Functionality

The different digital inputs are debounced and work as the following. The respective debounced status signal is set to status pressed if the status of the digital input reports pressed for DigitalInput_MinPressTime.

The debounced status is set to status not pressed if the status of the digital input reports not pressed for DigitalInput_MinPressTime.

The DigitalInput_DebouncedStatus is set to error if the status of the digital input reports error.

5.5.6 Temperature Control

Signal	Description
PTC0_Temperature (AC temperature inlet pin)	The PTC0 temperature value
PTC1_Temperature (DC temperature inlet pin)	The PTC1 temperature value
PTC2_Temperature (DC temperature inlet pin)	The PTC2 temperature value

Table 5-43 Temperature Control Signals

Parameter	Value
PTC0_NormalTemperature	20°C
PTC0_CriticalTemperature	120°C

Table 5-44 Temperature Control Parameters

Functionality

PTC0 shall be connected to a PTC sensor according to the supported inlet. The measured values are sent on CAN and used for the higher-level charging algorithm.

Note
Due to the specification of the supported inlet PTC0_Temperature is only sent on CAN preprocessed. The signal only contains two different values related to the measured resistance.

PTC0_NormalTemperature (600 Ohm <= PTC0_Resistance < 1500 Ohm)

PTC0_CriticalTemperature (1500 Ohm <= PTC0_Resistance <= 1600 Ohm)

The threshold of 1500 Ohm and the lower boundary of 600 Ohm are default values. If other values are required due to a specific PTC sensor, the threshold and the lower boundary can be configured via UDS as described in the chapter “UDS communication”. Please note that both values must be within a range from 400 Ohm to 5000 Ohm. Otherwise, the VC-EVCC is not able to measure the resistance value reliably.

The PTC0 can be activated/deactivated via UDS as described in the chapter “UDS communication”. The DTCs of the PTC0 are only evaluated by the VC-EVCC if the PTC0 is activated.

PTC1 and PTC2 shall be connected with a PT1000 sensor. The temperature is processed from the measured resistance for PTC1 and PTC2 if the respective self-diagnostic status is OK.

Parameter	Value
Critical temperature for DC Charging	90°C
Resistance of PTC1/PTC2	1347 Ohm

Table 5-45 Resistance Threshold of PTC1/PTC2 at the Critical Temperature of 90°C

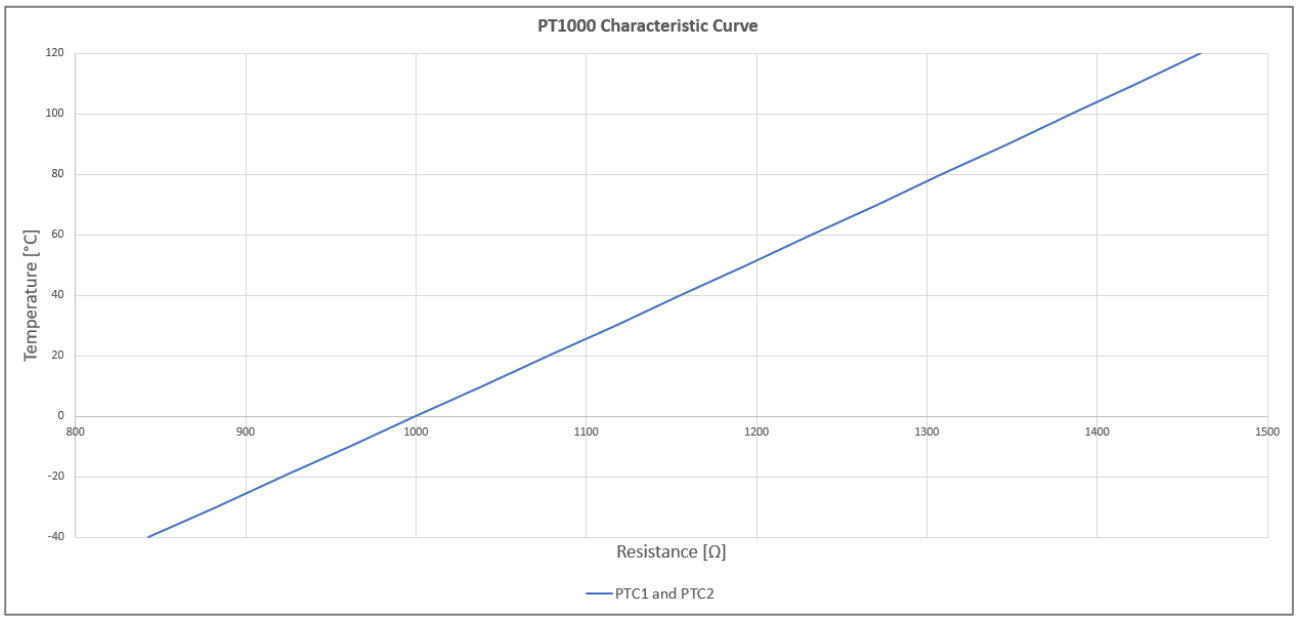


Figure 5-4: Characteristic Curve of PTC1 and PTC2 (PT1000)

The PTC1 and PTC2 can be activated/deactivated via UDS as described in the chapter “UDS communication”. The DTCs of the PTC1 and PTC2 are only evaluated by the VC-EVCC if the corresponding temperature sensor is activated.

All three temperature values of PTC0, PTC1 and PTC2 are set to error if the respective self-diagnostic status is not OK.

5.5.7 Charging with Control Pilot

Signal	Description
Vehicle_ChargePermission	The permission from the vehicle to start charging
ChargePwm_ModeBSettleTime	Time to pause the PWM charging after mode B was entered

Table 5-46 Charging with Control Pilot Signals

Parameter	Value
ChargePwm_ModeBSettleTime	1000ms

Table 5-47 Charging with Control Pilot Parameters

5.5.7.1 Functionality

The signal VCVCCU_ChargeUnit_State is set to mode C if

- VCVCCU_Inlet_MotorStatus is Locked and
- VCVCCU_PlugPresent_Status is Connected and
- VCVCCU_ChargeUnit_Mode is ChargePwm and
- VCVCCU_Vehicle_ChargePermission is set to Allowed and

- VCVCCU_Vehicle_PwmChargeModeRequest is set to PwmChargeModeRequestC and
- VCVCCU_PTC0_Temperature is PTC_NormalTemperatureAC (only if PTC0 is activated) and
- VCVCCU_DigitalInput_DebouncedStatus is not pressed and
- VCVCCU_S3Switch_DebouncedStatus is not pressed (only in case of Combo1) and
- VCVCCU_StopCharge is not pressed (only if StopCharge CAN signal is activated) and
- VCVCCU_Vehicle_ChargeSelection is set to “PrimaryNode” and VCVCCU_HighSideOut2_Input_DebouncedStatus is set to “Not_pressed” (only if charging arbitration is activated) or
- VCVCCU_Vehicle_ChargeSelection is set to “SecondaryNode” and VCVCCU_HighSideOut2_Input_DebouncedStatus is set to “Pressed” (only if charging arbitration is activated) and
- ChargePwm_ModeBSettleTime has elapsed

Note
If charge mode D (enable ventilation) shall be used, the vehicle must set the CAN signal VCVCCU_Vehicle_PwmChargeModeRequest to “PwmChargeModeRequestD”. All other conditions mentioned above must be fulfilled for charge mode D too.

The signal VCVCCU_ChargeUnit_State is set to mode B if

- VCVCCU_Inlet_MotorStatus isn't Locked or
- VCVCCU_PlugPresent_Status is not Connected and
- VCVCCU_ ChargeUnit_Mode is not ChargePwm or
- VCVCCU_Vehicle_ChargePermission is not set to allowed or
- VCVCCU_PTC0_Temperature is not PTC_NormalTemperatureAC (only if PTC0 is activated) or
- VCVCCU_DigitalInput_DebouncedStatus is pressed or
- VCVCCU_S3Switch_DebouncedStatus is pressed (only in case of Combo1) or
- VCVCCU_Vehicle_StopCharge is pressed (only if StopCharge CAN signal is activated) or
- Active DTC in the DM01 message (see charge error detection)

The VC-EVCC starts the ChargePwm_ModeBSettleTime after ControlPilot_ChargeMode was set from mode C to mode B due the above behavior.

Caution
The condition “VCVCCU_Inlet_MaxCurrent > VCVCCU_ChargeUnit_MaxCurrent” is not checked by the VC-EVCC. Both signals and the corresponding values are transmitted on CAN but there will be no intervention by the VC-EVCC if the value of the signal VCVCCU_ChargeUnit_MaxCurrent exceeds the value of the signal VCVCCU_Inlet_MaxCurrent. The VCU has the full responsibility to monitor the current value and likewise to react in case of exceedance of the maximum allowed current.

5.5.7.2 Charge Error Detection

The VC-EVCC provides a charge error detection. Therefore, the following Diagnostic Trouble Codes (DTC) are used to indicate missing information or invalid conditions which are needed for charging.

J1939 Vehicle CAN (CAN1):

- VCVCCU_ChargeFromVehicle E2E fault (0x20E0EA)

Charging Stop Switch (DIN):

- DIN ShortToBat error (DTC 0x04E0E3)

PTC0:

- PTC0 OutOfRange error (DTC 0x05E0E2)
- PTC0 ShortToBat error (DTC 0x05E0E3)
- PTC0 ShortToGnd error (DTC 0x05E0E4)
- PTC0 OpenLoad error (DTC 0x05E0E5)

Control Pilot:

- Control Pilot ShortToBat error (DTC 0x00E0E3)

Position Feedback:

- POS_FB ShortToBat error (DTC 0x02E0E3)
- POS_FB ShortToGnd error (DTC 0x02E0E4)
- POS_FB OpenLoad error (DTC 0x02E0E5)

Hardware Compatibility:

- Hardware Software Incompatibility error (DTC 0x40E0E2)

5.5.8 Charging with V2G

The following chapters describe the V2G charging and its dependencies to certain CAN signals. Common requests and response are equal within the DIN70121 and the ISO15118. Differences between the DIN70121 and the ISO15118 are described in separate chapters.

Signal	Description
Vehicle_LinkVoltage	The voltage at the vehicle side of the DC connection
Vehicle_ContactorVoltage	The voltage at the EVSE side of the DC connection
Vehicle_IsolationMeasurementRequest	The control request of the vehicle isolation measurement
Vehicle_IsolationMeasurementStatus	The status of the vehicle isolation measurement
Vehicle_ContactorRequest	The Representation of the control request of the vehicle contactors
Vehicle_ContactorStatus	The Representation of the status of the vehicle contactors
ChargeV2G_PreChargeStabilityTime	The Representation of the time to wait during pre-charge for the voltages being stable
ChargeV2G_MaxAllowedTemperature	The Representation of the maximum temperature of the DC pins where V2G charging is still allowed:

Table 5-48 Charging with V2G Signals

Parameter	Value
ChargeV2G_MaxAllowedTemperature	90°C
ChargeV2G_PreChargeStabilityTime	500ms

Table 5-49 Charging with V2G Parameters

5.5.8.1 Initial Situation

- ControlPilot_ChargeMode is set to mode B.
- Vehicle_IsolationMeasurementRequest is set to activated.
- The VC-EVCC sets the following CAN signals initially and after any end of a V2G sequence to the specified values:
  - VCVCCU_V2G_DateTimeNowFlag to 0 (FALSE)
  - VCVCCU_V2G_EVSECurrentRegulationToleranceFlag to 0 (FALSE)
  - VCVCCU_V2G_EVSEEnergyToBeDeliveredFlag to 0 (FALSE)
  - VCVCCU_V2G_EVSEIsolationStatusFlag to 0 (FALSE)
  - VCVCCU_V2G_EVSEMaximumCurrentLimitFlag to 0 (FALSE)
  - VCVCCU_V2G_EVSEMaximumPowerLimitFlag to 0 (FALSE)
  - VCVCCU_V2G_EVSEMaximumVoltageLimitFlag to 0 (FALSE)
  - VCVCCU_Vehicle_ContactorRequest to 2 (ForceOpen)

5.5.8.2 Charge Error Detection

The VC-EVCC provides a charge error detection. Therefore, the following Diagnostic Trouble Codes (DTC) are used to indicate missing information or invalid conditions which are needed for charging.

J1939 Vehicle CAN (CAN1):

- VCVCCU_ChargeFromVehicle E2E fault (0x20E0EA)
- VCVCCU_V2G_EVMaximumCurrentLimit Timeout error (DTC 0x21E0E2)
- VCVCCU_V2G_EVMaximumVoltageLimit Timeout error (DTC 0x22E0E2)
- VCVCCU_V2G_EVTargetCurrent Timeout error (DTC 0x23E0E2)
- VCVCCU_V2G_EVTargetVoltage Timeout error (DTC 0x24E0E2)
- VCVCCU_V2G_VehicleStatus Timeout error (DTC 0x25E0E2)

Note
Timeout duration is five times of the message cycle time.

Charging Stop Switch (DIN):

- DIN ShortToBat error (DTC 0x04E0E3)

PTC1:

- PTC1 ShortToBat error (DTC 0x06E0E3)
- PTC1 ShortToGnd error (DTC 0x06E0E4)
- PTC1 OpenLoad error (DTC 0x06E0E5)

PTC2:

- PTC2 ShortToBat error (DTC 0x07E0E3)
- PTC2 ShortToGnd error (DTC 0x07E0E4)
- PTC2 OpenLoad error (DTC 0x07E0E5)

Control Pilot:

- Control Pilot ShortToBat error (DTC 0x00E0E3)

Position Feedback:

- POS_FB ShortToBat error (DTC 0x02E0E3)
- POS_FB ShortToGnd error (DTC 0x02E0E4)
- POS_FB OpenLoad error (DTC 0x02E0E5)

Hardware Compatibility:

- Hardware Software Incompatibility error (DTC 0x40E0E2)

Plug and Charge (only if feature is activated):

- Plug and Charge Configuration Error (DTC 0x2AE0E2)

5.5.8.3 Start Sequence

The communication with the EVSE over V2G is started if

- VCVCCU_Inlet_MotorStatus is locked and
- VCVCCU_ChargeUnit_Mode is ChargeV2G and
- VCVCCU_PTC1_Temperature is below ChargeV2G_MaxAllowedTemperature (only if PTC1 is activated) and
- VCVCCU_PTC2_Temperature is below ChargeV2G_MaxAllowedTemperature (only if PTC2 is activated) and
- VCVCCU_DigitalInput_DebouncedStatus is not pressed and
- VCVCCU_S3Switch_DebouncedStatus is not pressed (only in case of Combo1) and
- VCVCCU_Vehicle_StopCharge is not pressed (only if StopCharge CAN signal is activated) and
- VCVCCU_Vehicle_ChargeSelection is set to “PrimaryNode” and VCVCCU_HighSideOut2_Input_DebouncedStatus is set to “Not_pressed” (only if charging arbitration is activated) or
- VCVCCU_Vehicle_ChargeSelection is set to “SecondaryNode” and VCVCCU_HighSideOut2_Input_DebouncedStatus is set to “Pressed” (only if charging arbitration is activated) and
- ChargeV2G start trigger is set and
- No active DTC is detected (except DTCs of Full Bridge 12V)

Caution
At least one temperature sensor, either PTC1 or PTC2, must be activated for DC charging.

On a change of signal VCVCCU_ChargeUnit_Mode from “not ChargeV2G” to “ChargeV2G” the trigger to charge is set. This trigger is reset after a start of the V2G charge sequence or on a reset of the VC-EVCC.

If the V2G communication is started according to the start sequence Vehicle_ContactorRequest is set to Open.

5.5.8.4 SECC Discovery Protocol

The VC-EVCC sends the SECCDiscoveryReq after a communication link has been successfully established with the EVSE.

5.5.8.4.1 Common Request Parameter

If there is no V2G TLS Activation configuration done the SECCDiscoveryReq sets the Security parameter to 0x10 (No transport layer security).

If V2G TLS Activation configuration is done the VC-EVCC should use the configured value for the Security parameter of the SECCDiscoveryReq.

- TLS activated: 0x00 (secured with TLS)
- TLS not activated: 0x10 (No transport layer security)

5.5.8.4.2 Common Response Parameter

The SECC IP Address of the SECCDiscoveryRes is evaluated.
The SECC Port of the SECCDiscoveryRes is evaluated.
The Transport Protocol of the SECCDiscoveryRes is evaluated.

5.5.8.5 Connect Transport Layer

5.5.8.5.1 Transmission Control Protocol (TCP)

The VC-EVCC establishes an unsecure TCP connection using the SECC IP address and SECC Port of the SECCDiscoveryRes if

- SECCDiscoveryProtocolRes has been received and
- conditions for a sequence error reaction of SECCDiscoveryProtocol do not apply and
- the Security of the SECCDiscoveryRes is 0x10 (No transport layer security).

5.5.8.5.2 Transport Layer Security (TLS)

The VC-EVCC establishes a secure TLS/TCP connection using the SECC IP address and SECC Port of the SECCDiscoveryRes if

- SECCDiscoveryProtocolRes has been received and
- conditions for a sequence error reaction of SECCDiscoveryProtocol do not apply and
- the Security of the SECCDiscoveryRes is 0x00 (secured with TLS).

The VC-EVCC uses Transport Layer Security version 1.2.
The VC-EVCC uses the configured TLS Certificates to validate the connection.

5.5.8.6 Supported App Protocol

The supportedAppProtocolReq is sent after the successful communication setup with the EVSE.

5.5.8.6.1 Common Request Parameter

The supportedAppProtocolReq contains the ISO15118 protocol with priority 1 (high priority) and the DIN70121 protocol with priority 2 (lower priority).

5.5.8.6.2 Common Response Parameter

If the supportedAppProtocolRes contains the DIN 70121 as supported protocol (SchemaID) by the EVSE, the DIN 70121 sequence will be processed.

If the supportedAppProtocolRes contains the ISO 15118 as supported protocol (SchemaID) by the EVSE, the ISO 15118 sequence will be processed.

5.5.8.7 Session Setup

The VC-EVCC proceeds with the SessionSetupReq if the response code in the supportedAppProtocolRes was OK and the SchemaID refers to one of the supported protocols.

5.5.8.7.1 Common Request Parameter

The SessionSetupReq sets the EVCCID to the MAC address of the VC-EVCC. The individual MAC address of the VC-EVCC is calculated with a specified MAC base address and the consecutive Vector serial number.

5.5.8.7.2 Common Response Parameter

The EVSEID of the SessionSetupRes is ignored.

5.5.8.7.3 DIN 70121 Response Parameter

If the SessionSetupRes contains DateTimeNow the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_DateTimeNow and
- sets the value of the CAN signal VCVCCU_V2G_DateTimeNowFlag to 1.

5.5.8.7.4 ISO 15118 Response Parameter

If the SessionSetupRes contains EVSETimeStamp the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_DateTimeNow and
- sets the value of the CAN signal VCVCCU_V2G_DateTimeNowFlag to 1.

5.5.8.8 Service Discovery

The VC-EVCC sends the ServiceDiscoveryReq if the response code in the SessionSetupRes was OK.

The ServiceDiscoveryReq does not use the ServiceScope and Service Category parameter.

5.5.8.9 Service Detail

The VC-EVCC proceeds with the ServiceDetailReq if

Option 1 (VAS):

- Charging protocol is ISO 15118
- TLS connection has been established successfully during SECC Discovery and
- The response code in the ServiceDiscovery was OK and
- Value Added Services are activated (“Fixed IP address” or “URL”) and
- SECC offered a service in the ServiceList of ServiceDiscoveryResponse as specified below:
  - ServiceID: 3
  - FreeService: TRUE

Option 2 (PnC):

- Charging protocol is ISO 15118
- TLS connection has been established successfully during SECC Discovery and
- The response code in the ServiceDiscovery was OK and
- Plug and Charge is activated and
- Payment Option “Contract” is supported by the SECC and

- One of the following conditions concerning the contract certificate applies and
  - No contract certificate is installed
  - Invalid contract certificate is installed
  - Currently installed contract certificate is within 1 day of expiry
- SECC offered a service in the ServiceList of ServiceDiscoveryResponse as specified below:
  - ServiceID: 2
  - FreeService: TRUE

5.5.8.10 PaymentServiceSelection (ISO) / ServicePaymentSelection (DIN)

The VC-EVCC supports “ExternalPayment” as well as “Contract” (Plug and Charge) as selected payment options.

5.5.8.10.1 Common Request Parameter

The VC-EVCC replies with “ExternalPayment” within the ServicePaymentSelectionReq SelectedPaymentOption if Plug and Charge is deactivated. If Plug and Charge is activated the VC-EVCC replies with “Contract” as SelectedPaymentOption.

In the ServicePaymentSelectionReq the ServiceID of the received Charging Service listed in the ServiceDiscoveryRes is used.

5.5.8.10.2 ISO 15118 Request Parameter

The following Services are added to the SelectedServiceList if the corresponding feature is activated.

If VAS are supported by the EVSE, the PaymentServiceSelectionReq adds the Value Added Service as a SelectedService to the SelectedServiceList as described below:

- ServiceID: 3
- ParameterSetID: 4

If contract installation is supported by the EVSE, the PaymentServiceSelectionReq adds contract installation as a SelectedService to the SelectedServiceList as described below:

- ServiceID: 2
- ParameterSetID: 1

If contract update is supported by the EVSE, the PaymentServiceSelectionReq adds contract update as a SelectedService to the SelectedServiceList as described below:

- ServiceID: 2
- ParameterSetID: 2

5.5.8.11 Certificate Installation

The VC-EVCC proceeds with the CertificateInstallationReq if

- Charging protocol is ISO 15118
- ServicePaymentSelectionRes/ PaymentServiceSelectionRes has been received

- PaymentOption “Contract” is selected
- Certificate installation service is supported by the EVSE
- No valid contract certificate is installed

5.5.8.12 Certificate Update

The VC-EVCC proceeds with the CertificateUpdateReq if

- Charging protocol is ISO 15118
- ServicePaymentSelectionRes/ PaymentServiceSelectionRes has been received
- PaymentOption “Contract” is selected
- Certificate update service is supported by the EVSE
- The currently installed contract certificate is within 1 day of expiry

5.5.8.13 Payment Details

The VC-EVCC proceeds with the PaymentDetailsReq if

- Charging protocol is ISO 15118
- PaymentOption “Contract” is selected
- A valid contract certificate and private key is currently installed
- ServicePaymentSelectionRes/ PaymentServiceSelectionRes or CertificateInstallationRes or CertificateUpdateRes has been received

5.5.8.14 Authorization (ISO) / ContractAuthentication (DIN)

The VC-EVCC proceeds with the AuthorizationReq/ContractAuthenticationReq if the response code in the PaymentServiceSelectionRes/ServicePaymentSelectionRes was OK. In addition, the PaymentDetailsRes must be received successfully if Plug and Charge is used.

5.5.8.15 Charge ParameterDiscovery

The VC-EVCC proceeds with the ChargeParameterDiscoveryReq if

- the EVSEProcessing status in the ContractAuthenticationRes is finished and the response code was OK and
- the ChargeService.EnergyTransferType/ ChargeService.SupportedEnergyTransferMode in the ServiceDiscoveryRes contains the value of the CAN signal VCVCCU_V2G_StateM_EnergyTransferMode and
- the CAN signal VCVCCU_V2G_EVMaximumCurrentLimitFlag is 1 and
- the CAN signal VCVCCU_V2G_EVMaximumVoltageLimitFlag is 1

If charging schedules are activated the conditions for proceeding with the ChargeParameterDiscoveryReq are extended as follows.

- PowerDeliveryRes(Renegotiate) has been received and ControlPilot_ChargeMode is set to mode B.

5.5.8.15.1 DC_EVStatus Request Parameter

The ChargeParameterDiscoveryReq is filled with the content of the received CAN signals according to the table below.

ChargeParameterDiscoveryReq	CAN Signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode CAN
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-50 ChargeParameterDiscoveryReq CAN Signal Mapping

5.5.8.15.2 Common Request Parameter

The ChargeParameterDiscoveryReq sets EVRequestedEnergyTransferType/RequestedEnergyTransferMode to VCVCCU_V2G_StateM_EnergyTransferMode CAN signal.

Note

The EVSE reports the supported energy transfer modes for DC charging in the ServiceDiscoveryRes.

The VC-EVCC transmits this information within the CAN signal VCVCCU_V2G_StateM_EnergyTransferModeFlags.

The supported modes list within the signal VCVCCU_V2G_StateM_EnergyTransferModeFlags is a binary combination of the modes mentioned below.

The VC-EVCC supports the following energy transfer modes for DC charging:

DC core (coded as 0x04)

DC extended (coded as 0x08)

DC combo core (coded as 0x10)

DC unique (coded as 0x20)

The unsupported energy transfer modes for DC charging are:

AC single phase core (coded as 0x01)

AC three phase core (coded as 0x02)

The VC-EVCC will stop the charging sequence if unsupported values are requested!

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.EVMaximumCurrentLimit and fill with the VCVCCU_V2G_EVMaximumCurrentLimit CAN signals.

Note
VCVCCU_V2G_EVMaximumCurrentLimitFlag has to be 1 (already a condition to send the ChargeParameterDiscoveryReq)

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.EVMaximumPowerLimit and fill with the VCVCCU_V2G_EVMaximumPowerLimit CAN signals if VCVCCU_V2G_EVMaximumPowerLimitFlag is 1.

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.EVMaximumVoltageLimit and fill with the VCVCCU_V2G_EVMaximumVoltageLimit CAN signals.

Note
VCVCCU_V2G_EVMaximumVoltageLimitFlag has to be 1 (already a condition to send the ChargeParameterDiscoveryReq)

Caution
The multiplier of the EVMaximumVoltageLimit, EVMaximumCurrentLimit and EVMaximumPowerLimit must be within the range from -3 to 3.

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.EVEnergyCapacity and fill with the VCVCCU_V2G_EVEnergyCapacity CAN signals if VCVCCU_V2G_EVEnergyCapacityFlag is 1.

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.EVEnergyRequest and fills with the VCVCCU_V2G_EVEnergyRequest CAN signals if VCVCCU_V2G_EVEnergyRequestFlag is 1.

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.FullSOC and fill with the VCVCCU_V2G_FullSOC CAN signals if VCVCCU_V2G_FullSOCFlag is 1.

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.BulkSOC and fill with the VCVCCU_V2G_BulkSOC CAN signals if VCVCCU_V2G_BulkSOCFlag is 1.

5.5.8.15.3 ISO 15118 Request Parameter

The ChargeParameterDiscoveryReq uses DC_EVChargeParameter.DepartureTime and fill with the VCVCCU_V2G_DepartureTime CAN signals if VCVCCU_V2G_DepartureTimeFlag is 1.

5.5.8.15.4 ISO 15118 Schedule Request Parameter

The ChargeParameterDiscoveryReq sets MaxEntriesSAScheduleTuple depending on the charging schedules configuration.

- Charging Schedules are deactivated: The ChargeParameterDiscoveryReq sets MaxEntriesSAScheduleTuple to 1.

- Charging Schedules are activated: The ChargeParameterDiscoveryReq sets MaxEntriesSAScheduleTuple to 24.

5.5.8.15.5 DC_EVSEStatus Response Parameter

DC_EVSEChargeParameter.DC_EVSEStatus.EVSENotification of the ChargeParameterDiscoveryRes is transmitted in the VCVCCU_V2G_EVSENotification CAN signal.

DC_EVSEChargeParameter.DC_EVSEStatus.NotificationMaxDelay of the ChargeParameterDiscoveryRes is transmitted in the VCVCCU_V2G_NotificationMaxDelay CAN signal.

DC_EVSEChargeParameter.DC_EVSEStatus.DC_EVSEStatusCode of the ChargeParameterDiscoveryRes is transmitted in the VCVCCU_V2G_EVSEStatusCode CAN signal.

If the ChargeParameterDiscoveryRes contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and
- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1

5.5.8.15.6 Common Response Parameter

The DC_EVSEChargeParameter.EVSEMaximumCurrentLimit of the ChargeParameterDiscoveryRes is transmitted in the CAN signal

- VCVCCU_V2G_EVSEMaximumCurrentLimit and
- The value of the CAN signal VCVCCU_V2G_EVSEMaximumCurrentLimitFlag is set to 1

The DC_EVSEChargeParameter.EVSEMaximumPowerLimit of the ChargeParameterDiscoveryRes is transmitted in the CAN signal

- VCVCCU_V2G_EVSEMaximumPowerLimit and
- the value of the CAN signal VCVCCU_V2G_EVSEMaximumPowerLimitFlag to 1

The DC_EVSEChargeParameter.EVSEMaximumVoltageLimit of the ChargeParameterDiscoveryRes is transmitted in the CAN signal

- VCVCCU_V2G_EVSEMaximumVoltageLimit and
- value of the CAN signal VCVCCU_V2G_EVSEMaximumVoltageLimitFlag is set to 1

The DC_EVSEChargeParameter.EVSEMinimumCurrentLimit of the ChargeParameterDiscoveryRes is transmitted in the CAN signal VCVCCU_V2G_EVSEMinimumCurrentLimit.

If the ChargeParameterDiscoveryRes contains DC_EVSEChargeParameter.EVSEMinimumVoltageLimit the VC-EVCC sets the value in the CAN signal VCVCCU_V2G_EVSEMinimumVoltageLimit.

The DC_EVSEChargeParameter.EVSEPeakCurrentRipple of the ChargeParameterDiscoveryRes is transmitted in the CAN signal VCVCCU_V2G_EVSEPeakCurrentRipple.

If the ChargeParameterDiscoveryRes contains DC_EVSEChargeParameter.EVSECurrentRegulationTolerance the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSECurrentRegulationTolerance
- sets the CAN signal VCVCCU_V2G_EVSECurrentRegulationToleranceFlag to 1

If the ChargeParameterDiscoveryRes contains DC_EVSEChargeParameter.EVSEEnergyToBeDelivered the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEEnergyToBeDelivered
- sets the CAN signal VCVCCU_V2G_EVSEEnergyToBeDeliveredFlag to 1

5.5.8.15.7 Schedule Response Parameter

The VC-EVCC transmits the PMax value of the current PMaxScheduleEntry within the CAN signals VCVCCU_V2G_CurrentPMaxValue and VCVCCU_V2G_CurrentPMaxMultiplier.

The remaining time of the current PMaxScheduleEntry is calculated by the VC-EVCC with the help of the RelativeTimeInterval information and transmitted within the CAN signal VCVCCU_V2G_CurrentPMaxDuration.

The VC-EVCC transmits the PMax value of the subsequent PMaxScheduleEntry within the CAN signals VCVCCU_V2G_NextPMaxValue and VCVCCU_V2G_NextPMaxMultiplier.

Note
The SalesTariff information of the ChargeParameterDiscoveryRes is not considered by the VC-EVCC and thus not transmitted on the J1939 vehicle CAN.

5.5.8.16 Cable Check

The VC-EVCC proceeds with the CableCheckReq and sets the ControlPilot_ChargeMode to mode C if

- the response code in the ChargeParameterDiscoveryRes was OK and
- Vehicle_ChargePermission is set to allowed and
- Vehicle_ContactorStatus is Opened

5.5.8.16.1 DC_EVStatus Request Parameter

The CableCheckReq is filled with the content of the received CAN signals according to the table below.

CableCheckReq	CAN signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-51 CableCheckReq CAN Signal Mapping

5.5.8.16.2 DC_EVSEStatus Response Parameter

The CAN signals are filled with the parameters of the CableCheckRes according to the table below.

CableCheckRes	CAN signal
DC_EVSEChargeParameter.DC_EVSEStatus. EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter.DC_EVSEStatus. NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter.DC_EVSEStatus. DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode

Table 5-52 CableCheckRes CAN Signal Mapping

If the CableCheckRes contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and
- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1.

5.5.8.17 PreCharge

The VC-EVCC proceeds with the PreChargeReq and sets Vehicle_IsolationMeasurementRequest to not activated if the EVSEProcessing status in the CableCheckRes is finished and the response code was OK.

The Vehicle_ContactorRequest is set to Close if

- the difference between Vehicle_ContactorVoltage and the Vehicle_LinkVoltage is for ChargeV2G_PreChargeStabilityTime (500ms) less than 20V and
- Vehicle_IsolationMeasurementStatus is not active.

5.5.8.17.1 DC_EVStatus Request Parameter

The PreChargeReq is filled with the content of the received CAN signals according to the table below.

PreChargeReq	CAN signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode CAN
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-53 PreChargeReq CAN Signal Mapping

5.5.8.17.2 Common Request Parameter

The PreChargeReq uses EVTargetVoltage and fill with the VCVCCU_Vehicle_LinkVoltage CAN signal.

The PreChargeReq uses EVTargetCurrent and fill with the VCVCCU_V2G_EVTargetCurrent CAN signal.

5.5.8.17.3 DC_EVSEStatus Response Parameter

The CAN signals are filled with the parameters of the PreChargeRes according to the table below.

PreChargeRes	CAN signal
DC_EVSEChargeParameter.DC_EVSEStatus. EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter.DC_EVSEStatus. NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter.DC_EVSEStatus. DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode

Table 5-54 PreChargeRes CAN Signal Mapping

If the PreChargeRes contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and
- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1.

5.5.8.17.4 Common Response Parameter

If the PreChargeRes contains EVSEPresentVoltage the VC-EVCC sets the value in the CAN signal VCVCCU_V2G_EVSEPresentVoltage.

5.5.8.18 Power Delivery (TRUE)

The VC-EVCC proceeds with the PowerDeliveryReq(TRUE) if

- the PreCharge condition is still fulfilled and
- Vehicle_ContactorStatus is Closed

5.5.8.18.1 DC_EVStatus Request Parameter

The PowerDeliveryReq(TRUE) is filled with the content of the received CAN signals according to the table below.

PowerDeliveryReq(TRUE)	CAN signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-55 PowerDeliveryReq(TRUE) CAN Signal Mapping

5.5.8.18.2 Common Request Parameter

The PowerDeliveryReq(TRUE) uses DC_EVPowerDeliveryParameter.ChargingComplete and fills it with the VCVCCU_V2G_ChargingComplete CAN signal.

The PowerDeliveryReq(TRUE) uses DC_EVPowerDeliveryParameter.BulkChargingComplete and fills it with the VCVCCU_V2G_BulkChargingComplete CAN signal if VCVCCU_V2G_BulkChargingCompleteFlag is 1.

5.5.8.18.3 DIN 70121 Request Parameter

The PowerDeliveryReq(TRUE) sets ReadyToChargeState to TRUE.

5.5.8.18.4 ISO 15118 Request Parameter

The PowerDeliveryReq(TRUE) sets ChargeProgress to Start.

The PowerDeliveryReq(TRUE) sets SAScheduleTupleID to the first (in the list) received SAScheduleTupleID in the ChargeParameterDiscoveryRes.

5.5.8.18.5 DC_EVSEStatus Response Parameter

The CAN signals are filled with the parameters of the PowerDeliveryRes(TRUE) according to the table below.

PowerDeliveryRes(TRUE)	CAN signal
DC_EVSEChargeParameter.DC_EVSEStatus. EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter.DC_EVSEStatus. NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter.DC_EVSEStatus. DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode

Table 5-56 PowerDeliveryRes(TRUE) CAN Signal Mapping

If the PowerDeliveryRes(TRUE) contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and
- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1.

5.5.8.19 Current Demand

The VC-EVCC proceeds with cyclic transmission of CurrentDemandReq if the response code in the PowerDeliveryRes was OK.

The VC-EVCC extends the request-response loop in state CurrentDemand by a MeteringReceipt request and response if the following conditions are met.

- Payment option “Contract” has been selected
- The ReceiptRequired element is included within the CurrentDemandRes message and set to “TRUE”
- The MeterInfo record containing the MeterID is included within the CurrentDemandRes

5.5.8.19.1 DC_EVStatus Request Parameter

The CurrentDemandReq is filled with the content of the received CAN signals according to the table below.

CurrentDemandReq	CAN signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-57 CurrentDemandReq CAN Signal Mapping

5.5.8.19.2 Common Request Parameter

The CurrentDemandReq uses EVTargetCurrent and fills it with the VCVCCU_V2G_EVTargetCurrent CAN signal.

The CurrentDemandReq uses EVTargetVoltage and fills it with the VCVCCU_V2G_EVTargetVoltage CAN signal.

The CurrentDemandReq uses EVMaximumCurrentLimit and fills it with the VCVCCU_V2G_EVMaximumCurrentLimit CAN signal if VCVCCU_V2G_EVMaximumCurrentLimitFlag is 1.

The CurrentDemandReq uses EVMaximumPowerLimit and fills it with the VCVCCU_V2G_EVMaximumPowerLimit CAN signal if VCVCCU_V2G_EVMaximumPowerLimitFlag is 1.

The CurrentDemandReq uses EVMaximumVoltageLimit and fills it with the VCVCCU_V2G_EVMaximumVoltageLimit CAN signal if VCVCCU_V2G_EVMaximumVoltageLimitFlag is 1.

The CurrentDemandReq uses ChargingComplete and fills it with the VCVCCU_V2G_ChargingComplete CAN signal

The CurrentDemandReq uses BulkChargingComplete and fills it with the VCVCCU_V2G_BulkChargingComplete CAN signal if VCVCCU_V2G_BulkChargingCompleteFlag is 1.

The CurrentDemandReq uses RemainingTimeToFullSOC and fills it with the VCVCCU_V2G_RemainingTimeToFullSOC CAN signal if VCVCCU_V2G_RemainingTimeToFullSOCFlag is 1.

The CurrentDemandReq uses RemainingTimeToBulkSOC and fills it with the VCVCCU_V2G_RemainingTimeToBulkSOC CAN signal if VCVCCU_V2G_RemainingTimeToBulkSOCFlag is 1.

5.5.8.19.3 DC_EVSEStatus Response Parameter

The CAN signals are filled with the parameters of the CurrentDemandRes according to the table below.

CurrentDemandRes	CAN signal
DC_EVSEChargeParameter.DC_EVSEStatus. EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter.DC_EVSEStatus. NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter.DC_EVSEStatus. DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode

Table 5-58 CurrentDemandRes CAN Signal Mapping (DC_EVSEStatus)

If the CurrentDemandRes contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and
- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1.

5.5.8.19.4 Common Response Parameter

The CAN signals are filled with the parameters of the CurrentDemandRes according to the table below.

CurrentDemandRes	CAN signal
EVSEPresentVoltage	VCVCCU_V2G_EVSEPresentVoltage
EVSEPresentCurrent	VCVCCU_V2G_EVSEPresentCurrent
EVSECurrentLimitAchieved	VCVCCU_V2G_EVSECurrentLimitAchieved
EVSEVoltageLimitAchieved	VCVCCU_V2G_EVSEVoltageLimitAchieved
EVSEPowerLimitAchieved	VCVCCU_V2G_EVSEPowerLimitAchieved

Table 5-59 CurrentDemandRes CAN Signal Mapping (Common)

If the CurrentDemandRes contains EVSEMaximumCurrentLimit the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEMaximumCurrentLimit and
- sets the value of the CAN signal VCVCCU_V2G_EVSEMaximumCurrentLimitFlag to 1.

If the CurrentDemandRes contains EVSEMaximumPowerLimit the VC-EVCC

- sets the value with in CAN signal VCVCCU_V2G_EVSEMaximumPowerLimit and
- sets the value of the CAN signal VCVCCU_V2G_EVSEMaximumPowerLimitFlag to 1.

If the CurrentDemandRes contains EVSEMaximumVoltageLimit the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEMaximumVoltageLimit and
- set the value of the CAN signal VCVCCU_V2G_EVSEMaximumVoltageLimitFlag to 1.

5.5.8.19.5 ISO 15118 Response Parameter

The EVSEID of the CurrentDemandRes is ignored.

Remaining data in ISO 15118:

- EVSEID
- SAScheduleTupleID
- MeterInfo (optional)
- ReceiptRequired (optional)

5.5.8.20 Metering Receipt

The VC-EVCC proceeds with the MeteringReceiptReq if the following conditions are met.

- Charging protocol is ISO 15118
- CurrentDemandRes has been received
- Payment option “Contract” has been selected
- The ReceiptRequired element is included within the CurrentDemandRes message and set to “TRUE”
- The MeterInfo record containing the MeterID is included within the CurrentDemandRes

5.5.8.20.1 DC_EVSEStatus Response Parameter

The CAN signals are filled with the parameters of the MeteringReceiptRes according to the table below.

MeteringReceiptRes	CAN signal
DC_EVSEChargeParameter.DC_EVSEStatus. EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter.DC_EVSEStatus. NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter.DC_EVSEStatus. DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode

Table 5-60 CurrentDemandRes CAN Signal Mapping (DC_EVSEStatus)

If the MeteringReceiptRes contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and
- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1.

5.5.8.21 Power Delivery (Renegotiate)

The VC-EVCC proceeds with the PowerDeliveryReq(Renegotiate) if the following conditions are met.

- Charging Protocol is ISO 15118
- CurrentDemandRes or MeteringReceiptRes has been received
- The EVSE sets the parameter “EVSENotification” of the CurrentDemandRes or MeteringReceiptRes to “ReNegotiation”
- The EV sets the CAN signal VCVCCU_Vehicle_Renegotiate to “Requested”
- The last entry of the charging profile is active and the remaining duration equals the renegotiation time of 2 minutes

5.5.8.21.1 DC_EVStatus Request Parameter

The PowerDeliveryReq(Renegotiate) is filled with the content of the received CAN signals according to the table below.

PowerDeliveryReq(Renegotiate)	CAN signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-61 PowerDeliveryReq(Renegotiate) CAN Signal Mapping

5.5.8.21.2 Common Request Parameter

The PowerDeliveryReq(Renegotiate) uses DC_EVPowerDeliveryParameter.ChargingComplete and fill with the VCVCCU_V2G_ChargingComplete CAN signal.

The PowerDeliveryReq(Renegotiate) uses DC_EVPowerDeliveryParameter.BulkChargingComplete and fills with the VCVCCU_V2G_BulkChargingComplete CAN signal if VCVCCU_V2G_BulkChargingCompleteFlag is 1.

5.5.8.21.3 ISO 15118 Request Parameter

The PowerDeliveryReq(Renegotiate) sets ChargeProgress to “Renegotiate”.

The PowerDeliveryReq(Renegotiate) sets SAScheduleTupleID to the first (in the list) received SAScheduleTupleID in the ChargeParameterDiscoveryRes.

5.5.8.21.4 DC_EVSEStatus Response Parameter

The CAN signals are filled with the parameters of the PowerDeliveryRes(Renegotiate) according to the table below.

PowerDeliveryRes(Renegotiate)	CAN signal
DC_EVSEChargeParameter.DC_EVSEStatus.EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter.DC_EVSEStatus.NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter.DC_EVSEStatus.DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode

Table 5-62 PowerDeliveryReq(Renegotiate) CAN Signal Mapping

If the PowerDeliveryRes(Renegotiate) contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and
- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1.

5.5.8.22 Power Delivery (FALSE)

The VC-EVCC proceeds with the PowerDeliveryReq(FALSE) if

- VCVCCU_Vehicle_ChargePermission is not set to allowed or
- VCVCCU_ChargeUnit_Mode is not ChargeV2G or
- VCVCCU_PTC1_Temperature is not below ChargeV2G_MaxAllowedTemperature or
- VCVCCU_PTC2_Temperature is not below ChargeV2G_MaxAllowedTemperature or
- VCVCCU_DigitalInput_DebouncedStatus is pressed or
- VCVCCU_S3Switch_DebouncedStatus is pressed (only in case of Combo1) or
- VCVCCU_Vehicle_StopCharge is pressed (only if StopCharge CAN signal is activated)

Vehicle_ContactorRequest is set to Open if the response code in the PowerDeliveryRes(FALSE) was OK.

5.5.8.22.1 DC_EVStatus Request Parameter

The PowerDeliveryReq(FALSE) is filled with the content of the received CAN signals according to the table below.

PowerDeliveryReq(FALSE)	CAN signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-63 PowerDeliveryReq(FALSE) CAN Signal Mapping

5.5.8.22.2 Common Request Parameter

The PowerDeliveryReq(FALSE) uses DC_EVPowerDeliveryParameter.ChargingComplete and fill with the VCVCCU_V2G_ChargingComplete CAN signal.

The PowerDeliveryReq(FALSE) uses DC_EVPowerDeliveryParameter.BulkChargingComplete and fills with the VCVCCU_V2G_BulkChargingComplete CAN signal if VCVCCU_V2G_BulkChargingCompleteFlag is 1.

5.5.8.22.3 DIN 70121 Request Parameter

The PowerDeliveryReq(FALSE) sets ReadyToChargeState to FALSE.

5.5.8.22.4 ISO 15118 Request Parameter

The PowerDeliveryReq(FALSE) sets ChargeProgress to “Stop”.

The PowerDeliveryReq(FALSE) sets SAScheduleTupleID to the first (in the list) received SAScheduleTupleID in the ChargeParameterDiscoveryRes.

5.5.8.22.5 DC_EVSEStatus Response Parameter

The CAN signals are filled with the parameters of the PowerDeliveryRes(FALSE) according to the table below.

PowerDeliveryRes(FALSE)	CAN signal
DC_EVSEChargeParameter.DC_EVSEStatus.EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter.DC_EVSEStatus.NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter.DC_EVSEStatus.DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode

Table 5-64 PowerDeliveryRes(FALSE) CAN Signal Mapping

If the PowerDeliveryRes(FALSE) contains DC_EVSEChargeParameter.DC_EVSEStatus.EVSEIsolationStatus the VC-EVCC

- sets the value in the CAN signal VCVCCU_V2G_EVSEIsolationStatus and

- sets the value of the CAN signal VCVCCU_V2G_EVSEIsolationStatusFlag to 1.

5.5.8.23 Welding Detection

The VC-EVCC proceeds with WeldingDetectionReq and sets the ControlPilot_ChargeMode to mode B if Vehicle_ContactorStatus is Opened.

5.5.8.23.1 DC_EVStatus Request Parameter

The WeldingDetectionReq is filled with the content of the received CAN signals according to the table below.

WeldingDetectionReq	CAN signal
DC_EVChargeParameter.DC_EVStatus.EVReady	VCVCCU_V2G_EVReady
DC_EVChargeParameter.DC_EVStatus.EVErrorCode	VCVCCU_V2G_EVErrorCode
DC_EVChargeParameter.DC_EVStatus.EVRESSSOC	VCVCCU_V2G_EVRESSSOC

Table 5-65 WeldingDetectionReq CAN Signal Mapping

5.5.8.23.2 DC_EVSEStatus Response Parameter

The CAN signals are filled with the content of the corresponding WeldingDetectionRes parameter according to the table below.

WeldingDetectionRes	CAN signal
DC_EVSEChargeParameter. DC_EVSEStatus.EVSENotification	VCVCCU_V2G_EVSENotification
DC_EVSEChargeParameter. DC_EVSEStatus.NotificationMaxDelay	VCVCCU_V2G_NotificationMaxDelay
DC_EVSEChargeParameter. DC_EVSEStatus.DC_EVSEStatusCode	VCVCCU_V2G_EVSEStatusCode
DC_EVSEChargeParameter. DC_EVSEStatus.EVSEIsolationStatus	▶ VCVCCU_V2G_EVSEIsolationStatus ▶ VCVCCU_V2G_EVSEIsolationStatusFlag = 1

Table 5-66 WeldingDetectionRes CAN Signal Mapping

5.5.8.23.3 Common Response Parameter

If the WeldingDetectionRes contains EVSEPresentVoltage the VC-EVCC sets the value in the CAN signal VCVCCU_V2G_EVSEPresentVoltage.

5.5.8.24 Session Stop

The VC-EVCC proceeds with the SessionStopReq

- Vehicle_ContactorVoltage is less than 60V or
- WeldingDetectionRes is received five times in the correct loop sequence and
  - VCVCCU_DigitalInput_DebouncedStatus is pressed or
  - VCVCCU_S3Switch_DeboundedStatus is pressed (only in case of Combo1) or
  - VCVCCU_Vehicle_StopCharge is pressed (only if feature is activated).

5.5.8.24.1 ISO 15118 Request Parameter

The SessionStopReq sets the parameter ChargingSession as described below.

- ChargingSession is set to „Terminate” if the charging session is terminated by the EV or EVSE
- ChargingSession is set to “Pause” if charging schedules are activated and the EVSE has initiated a charge pause

5.5.8.25 Stop Sequence

The VC-EVCC sets Vehicle_IsolationMeasurementRequest to activated if the response code in the SessionStopRes was OK.

5.5.9 Charging with LIN

Signal	Description
LIN_EvAwake	Indication that the EV is ready for charging using LIN communication
Vehicle_ChargePermission	The permission from the vehicle to start charging

Table 5-67 Charging with LIN Signals

Parameter	Value
ChargeLIN_ToggleBaudRateTime	500ms

Table 5-68 Charging with LIN Parameters

5.5.9.1 Functionality

The ECU shall enable its LIN transceiver if

- LIN-CP charging functionality is enabled AND
- PlugPresent_Status has value "connected" AND
- ControlPilot_Status is StatusB1 AND
- either LINAwake is set to 1 OR
- wakeup frame via LIN has been received from EVSE

The signal VCVCCU_ChargeUnit_State is set to mode C and StatusOp is set to Permit_V if

- LINAwake is set to 1 AND
- EVSE_StatusOp is Permit_V AND
- LIN communication is active AND
- VCVCCU_Inlet_MotorStatus is Locked AND
- VCVCCU_PlugPresent_Status is Connected AND
- VCVCCU_Vehicle_ChargePermission is set to Allowed AND
- VCVCCU_PTC0_Temperature is PTC_NormalTemperatureAC (only if PTC0 is activated) AND
- VCVCCU_DigitalInput_DebouncedStatus is not pressed AND
- ChargeLin_TerminationOnError is not set to failed AND
- ChargeNode_Status is set to selected AND
- VCVCCU_Vehicle_StopCharge is neither pressed nor error (only if StopCharge CAN signal is activated) AND
- DTC 0x40E0E2 (HW SW incompatibility) is not set

The signal VCVCCU_ChargeUnit_State is set to mode B if

- LINAwake is set to 0 OR
- A sleep frame has been received from EVSE via LIN OR
- EVSE_StatusOp is set to Deny_V OR
- LIN communication has timed out for longer than ChargeLIN_NoLinTime OR
- Power outage was detected OR
- ControlPilot_ChargeComActv is set to active OR
- VCVCCU_Vehicle_ChargePermission is not set to allowed OR
- VCVCCU_PTC0_Temperature is not PTC_NormalTemperatureAC (only if PTC0 is activated) OR
- VCVCCU_DigitalInput_DebouncedStatus is pressed OR
- ChargeLin_TerminationOnError is active OR
- VCVCCU_S3Switch_DebouncedStatus is pressed (only in case of Combo1) OR
- VCVCCU_Vehicle_StopCharge is either pressed or error (only if StopCharge CAN signal is activated) OR

The ECU shall end the LIN session if

- VCVCCU_PlugPresent_Status is Not_Connected OR
- LIN communication has timed out for longer than ChargeLIN_NoLinTime OR
- Power outage was detected.

The ECU shall end the LIN session and go to sleep mode if

- a LIN sleep frame has been received from the EVSE.

The ECU shall set the LIN signal EvAwake to 0 in order to request LIN sleep at EVSE if

- ControlPilot_ChargeMode has changed from Mode C to Mode B OR
- LINAwake changes from 1 to 0 (falling edge) OR
- DigitalInput_DebouncedStatus is pressed OR
- S3Switch_DebouncedStatus is pressed OR
- ChargeNode_Status is not set to selected (as described in PJ-SWREQ-183476) OR
- "StopCharge CAN Signal" is active and Vehicle_StopCharge is either 'Pressed' or 'Error' OR
- VCVCCU_PlugPresent_Status is Not_Connected

5.5.9.2 Charge Error Detection

The VC-EVCC provides a charge error detection. Therefore, the following Diagnostic Trouble Codes (DTC) are used to indicate missing information or invalid conditions which are needed for charging.

J1939 Vehicle CAN (CAN1) errors:

- VCVCCU_ChargeFromVehicle E2E fault (0x20E0EA)

Note
Timeout duration is five times the message cycle time.

Charging Stop Switch (DIN) errors:

- DIN ShortToBat error (DTC 0x04E0E3)

PTC0 errors:

- PTC0 OutOfRange error (DTC 0x05E0E2)
- PTC0 ShortToBat error (DTC 0x05E0E3)
- PTC0 ShortToGnd error (DTC 0x05E0E4)
- PTC0 OpenLoad error (DTC 0x05E0E5)

Control Pilot errors:

- Control Pilot ShortToBat error (DTC 0x00E0E3)

Position Feedback errors:

- POS_FB ShortToBat error (DTC 0x02E0E3)
- POS_FB ShortToGnd error (DTC 0x02E0E4)
- POS_FB OpenLoad error (DTC 0x02E0E5)

Hardware Compatibility error:

- Hardware Software Incompatibility error (DTC 0x40E0E2)

LIN Timeout errors:

- VCVCCU_LIN_EvMaxMinCurrents Timeout (DTC 0x41E0E2)
- VCVCCU_LIN_EvMaxVoltageList Timeout (DTC 0x42E0E2)
- VCVCCU_LIN_EvMinVoltageList Timeout (DTC 0x43E0E2)
- VCVCCU_LIN_EvPresentCurrentList Timeout (DTC 0x44E0E2)
- VCVCCU_LIN_EvStatus Timeout (DTC 0x45E0E2)

5.6 Value Added Services

Value Added Services (VAS) are specified as a part of ISO 15118-1 standard. The objective of VAS is to exchange information between Vehicle (Vehicle Charging Controller Unit) and SECC (Infrastructure) which is not a part of V2G communication.

The VC-EVCC supports VAS according to the VDV 261 specification [8]. Vehicle to Infrastructure Communication Protocol (V2ICP) as defined in VDV 261 is used to exchange this information.

Note
VAS is an optional service and is not mandatory for charging.

5.6.1 Functionality

The communication with the backend server is started if

- TLS communication has been successfully established for V2G Session
- Service ID: 3 was available in ServiceList
- ParameterSet ID: 4 was available in ServiceParameterList with parameter name as “https” and parameter port as 443
- AuthorizationRes has been received with ResponseCode = OK and EVSEProcessing = Finished
- VAS Configuration parameters and the TLS certificate are configured correctly

5.6.1.1 HTTP Request

If the above conditions are fulfilled successfully, the VC-EVCC will try to establish a connection with the backend and will send the HTTP Request. The request contains a payload with signals encoded in Json format.

5.6.1.2 HTTP Response

The VC-EVCC expects a HTTP Response with Response Code 200 from the backend with its signals encoded in Json format.

5.6.1.3 Request Response Loop

The request-response loop will continue, and the data exchange will take place between the vehicle and the backend.

The request-response loop will end if

- V2G Session has ended
- Sending of HTTP Request is not possible
- No response is received from the backend for 3 consecutive HTTP requests.

Once the VAS communication has ended, the reconnection will take place only after a new V2G session has started.

5.6.2 Signal Mapping

The following CAN signals are forwarded to the backend in the Http Request.

VD Message contains TotalVehicleDistance signal.
VCVCCU_V2ICP_VehicleToBackend consists of other preconditioning related signals.
Apart from that, there are other Json signals which are handled internally by VC-EVCC and are also forwarded to the backend in the Http Request.

CAN Signal	Json Parameter	Description
-	vin	Username configured as VIN of the vehicle
-	evccid	MAC ID of the VC-EVCC
TotalVehicleDistance	odo	Odometer reading
VCVCCU_V2ICP_RequiredDuration ToPreconditionBattery	bat_reqtime	Required duration to precondition battery
VCVCCU_V2ICP_RequiredEnergy ToChargeBattery	bat_eamount	Required energy to charge battery
VCVCCU_V2ICP_RequiredEnergy ToPreconditionVehicle	prec_eamount	Required energy to precondition vehicle
VCVCCU_V2ICP_RequiredDuration ToPreconditionVehicle	prec_reqtime	Required duration to precondition vehicle
-	chrg_stat	Vehicle charging status

The signals received from the backend in Http Response are forwarded in the CAN Message VCVCCU_V2ICP_BackendToVehicle.

Json Parameter	CAN Signal	Description
driveoff	VCVCCU_V2ICP_ ScheduledDepartureTime	Scheduled departure time
prec_dsrd	VCVCCU_V2ICP_ PreconditioningDesired	Preconditioning desired
prec_hvac	VCVCCU_V2ICP_ PreconditioningDesiredHVAC	Type of preconditioning
ambienttemp	VCVCCU_V2ICP_ AmbientTemperature	Ambient temperature outside the garage

5.6.3 Fault Memory

The VC-EVCC provides an error detection for Value Added Service. Therefore, the following Diagnostic Trouble Codes (DTC) are used to indicate missing information or invalid conditions which are needed for value added services.

V2ICP_WrongConfiguration:

- WrongConfiguation error (DTC 0x26E0E2)

V2ICP_CommunicationError:

- Communication error (DTC 0x27E0E2)

5.7 Charging Arbitration

The charging arbitration enables the operation of two VC-EVCCs on the same CAN channel. It targets use cases which require two charging inlets per vehicle but only one charging inlet is used for charging at a time.

5.7.1 Functionality

For charging arbitration, the VC-EVCC supports three selectable modes:

- **Passive node:** The VC-EVCC has limited communication and functionality and has no clearance to charge.
- **Active node:** The VC-EVCC has normal communication and functionality but has no clearance to charge.
- **Selected node:** The VC-EVCC has normal communication and functionality and has a clearance to charge.

If charging arbitration is not used the Charge Node Selection must be set to “off” (default value). In this case the VC-EVCC uses the primary source address and operates always in mode “Selected node”.

If charging arbitration is used the Charge Node Selection must be set to “on” via UDS. In order to run two VC-EVCCs on the J1939 vehicle CAN, two different Source Addresses are required. The configuration of both Source Addresses as well as the activation of the Charge Node Selection via UDS is described in the chapter “UDS communication”. The VC-EVCC selects the Source Address to be used for operation according to the input voltage of the High Side Output 2 at startup. Please note that the High Side Output 2 is configured as an Input. The input voltage of the High Side Output 2 is interpreted as follows.

HS_OUT2 input voltage level	VC-EVCC Source Address
< 4500mV	Primary Source Address
>= 4500mV	Secondary Source Address

Table 5-69: HS_OUT2 Input Voltage Hysteresis

The VCU determines the VC-EVCC which is allowed to charge charge by setting the CAN-signal VCVCCU_Vehicle_ChargeSelection to “PrimaryNode” or “SecondaryNode”. The acknowledgement is sent by both VC-EVCCs within the signal VCVCCU_Vehicle_ChargeSelectionAck.

The mode of each VC-EVCC is determined as follows:

- **Passive node:**
  - > VCVCCU_Vehicle_ChargeSelection is set to “PrimaryNode” and
  - > HS_OUT2 input voltage is pressed or
  - > VCVCCU_Vehicle_ChargeSelection is set to “SecondaryNode” and
  - > HS_OUT2 input voltage is not pressed

- **Active node:**
  - > VCVCCU_Vehicle_ChargeSelection is set to “SNA” or “Error”
- **Selected node:**
  - > VCVCCU_Vehicle_ChargeSelection is set to “PrimaryNode” and
  - > HS_OUT2 input voltage is not pressed or
  - > VCVCCU_Vehicle_ChargeSelection is set to “SecondaryNode” and
  - > HS_OUT2 input voltage is pressed

Note
If a VC-EVCC and a VC-VCCU are operated on the same CAN channel the vehicle must ensure that E2E protection is applied on the message “VCVCCU_ChargeFromVehicle” when the VC-EVCC is the selected node.

5.8 Plug and Charge

The VC-EVCC supports Plug and Charge (PnC) according to ISO 15118. Plug and Charge provides an automatic authentication and authorization process via TLS-secured charging communication.

5.8.1 Preconditions

The following preconditions must be fulfilled in order to use Plug and Charge with the VC-EVCC.

- Activation of TLS via UDS
- Successful configuration of a TLS certificate via UDS
- Activation of Plug and Charge via UDS
- Availability of an ISO 15118-compliant Public Key Infrastructure (PKI)

An ISO 15118-compliant PKI contains certain certificates which must be installed on the VC-EVCC. It is mandatory to install the following certificates/private keys.

- PnC Root Certificate
- OEM Provisioning Certificate and Private Key
- PnC Sub Certificate (at least one Sub Certificate must be installed)
- PnC Contract Certificate and Private Key
  - > Use Case 1: Contract certificate installation via UDS
  - > Use Case 2: Contract certificate installation via charge protocol (Certificate Installation/Certificate Update)

The VC-EVCC supports both use cases to install the contract certificate. All other certificates can be installed only via UDS.

Note
Details about the activation of Plug and Charge/TLS and the configuration of certificates are included in the chapter “UDS communication”.

5.8.2 Functionality

If all preconditions are fulfilled Plug and Charge can be used for DC charging. Since Plug and Charge is only supported by the ISO 15118 the EVSE must support and select the ISO 15118 protocol in state SupportedAppProtocol. The VC-EVCC will always set the ISO 15118 protocol to priority 1 and DIN 70121 to priority 2.

5.8.2.1 Charging Communication

The charging communication is extended by the following message sets which are required for Plug and Charge.

- ServiceDetailReq/Res

- PaymentDetailsReq/Res
- CertificateInstallationReq/Res
- CertificateUpdateReq/Res
- MeteringReceiptReq/Res

If the EVSE supports Service ID 2 the VC-EVCC will select payment option “Contract” within the PaymentServiceSelectionReq and request Payment Details.

If no PnC Contract Certificate is installed and the EVSE supports the ParameterSetID 1 (Contract Certificate Installation), the VC-EVCC will initiate the installation of a new Contract Certificate by sending the CertificateInstallationReq.

If an existing PnC Contract Certificate is about to expire within one day and the EVSE supports the ParameterSetID 2 (Contract Certificate Update), the VC-EVCC will initiate an update of the Contract Certificate by sending the CertificateUpdateReq.

Note
A detailed description of the charging sequence with the message sets for Plug and Charge is included the chapter “Charging with V2G”.

5.8.2.2 J1939 CAN Communication

The vehicle must send the message “TD” so that the VC-EVCC can check the validity of certificates. There are no further CAN messages or signals which are dedicated for Plug and Charge.

5.8.3 Fault Memory

The VC-EVCC provides an error detection for Plug and Charge. Therefore, the following diagnostic trouble code is used to indicate configuration errors of certificates/private keys.

- Plug and Charge Configuration Error (DTC 0x2AE0E2)

5.9 Charging Schedules

The VC-EVCC supports the usage of charging schedules according to ISO 15118.

5.9.1 Preconditions

The following preconditions must be fulfilled in order to use Charging Schedules with the VC-EVCC.

- Activation of Charging Schedules via UDS
- The charge cable must be connected during the whole charging session including charge pauses
- The inlet must be locked during the whole charging session including charge pauses

Note
Details about the activation of Charging Schedules are included in the chapter “UDS communication”.

5.9.2 Functionality

If all preconditions are fulfilled Charging Schedules can be used for DC charging. During a charging session the EVSE must support and select the ISO 15118 protocol in state SupportedAppProtocol. The VC-EVCC will always set the ISO 15118 protocol to priority 1 and DIN 70121 to priority 2.

The available SAScheduleList is transmitted by the EVSE in state ChargeParameterDiscovery. The VC-EVCC limits the MaxEntriesSAScheduleTuple to 24 within the ChargeParameterDiscoveryReq.

The VC-EVCC will use the first SAScheduleTuple for charging and send the corresponding SAScheduleTupleID back to the EVSE within the PowerDeliveryReq.

Note
The VC-EVCC does neither consider the SalesTariff information provided in ChargeParameterDiscoveryRes for charging nor transmit any of the SalesTariff information on the J1939 vehicle CAN.

The following CAN signals are used for Charging Schedules on the J1939 vehicle CAN.

- VCVCCU_V2G_CurrentPMaxValue
- VCVCCU_V2G_CurrentPMaxDuration
- VCVCCU_V2G_CurrentPMaxMultiplier
- VCVCCU_V2G_NextPMaxMultiplier
- VCVCCU_V2G_NextPMaxValue
- VCVCCU_Vehicle_Renegotiate

The VC-EVCC transmits the PMax value of the current PMaxScheduleEntry within the CAN signals VCVCCU_V2G_CurrentPMaxValue and VCVCCU_V2G_CurrentPMaxMultiplier.

The remaining time of the current PMaxScheduleEntry is calculated by the VC-EVCC with the help of the RelativeTimeInterval information and transmitted within the CAN signal VCVCCU_V2G_CurrentPMaxDuration.

The VC-EVCC transmits the PMax value of the subsequent PMaxScheduleEntry within the CAN signals VCVCCU_V2G_NextPMaxValue and VCVCCU_V2G_NextPMaxMultiplier.

Caution
The EV must not exceed the given power limit of the EVSE. Therefore, the PMax value must be considered for the calculation of the target voltage value and target current value.

5.9.2.1 Pause and Resume a Charging Session

The VC-EVCC pauses the current charging session if the PMax value of a PMaxScheduleEntry equals 0W and the duration is greater or equal to 15 minutes.

Note
If the pause time is less than 15 minutes, the VC-EVCC will remain in state CurrentDemand and not stop the charging communication. In this case, the vehicle must still follow the PMax value of the EVSE and set the target current to 0A while charging is paused.

During a charge pause the VC-EVCC could go to sleep or stay awake depending on the active wakeup reasons. If the VC-EVCC goes to sleep during the charge pause, it will wake up automatically after the charge pause has finished.

Once the charge pause is finished the VC-EVCC wakes up the EVSE by performing a BCB-Toggle on the control pilot line and reestablishes a new charging session once the Control Pilot state changes from B1 to B2.

Caution
The VC-EVCC requires a Control pilot state change from B1 to B2 in order to start a new charging session

Note
The VC-EVCC does not store the SAScheduleTuples that was used before the charge pause. Therefore, the VC-EVCC will always request a new/updated SAScheduleTuple when reestablishing a new charging session after a charge pause.

5.9.2.2 Renegotiation of Charging Schedules

The VC-EVCC will initiate a renegotiation of charging schedules with the EVSE if one of the following scenarios applies:

- The EVSE sets the parameter “EVSENotification” of the CurrentDemandRes or MeteringReceiptRes to “ReNegotiation”
- The EV sets the CAN signal VCVCCU_Vehicle_Renegotiate to “Requested”
- The last entry of the charging profile is active and the remaining duration equals the renegotiation time of 2 minutes

Note
A renegotiation of charging schedules can only be triggered by the EV in state CurrentDemand/MeteringReceipt

5.10 Functional Safety

The VC-EVCC follows safety targets according to ASIL B. Details about functional safety are included in the Safety Manual which is part of the delivery content.

6 Electrical Characteristics

This section describes the electronic design of the VC-EVCC.

Note
Options and variants described below shall give an overview of possible project specific adaptions pre considered in the design.

6.1 High-Speed CAN

High speed CAN Bus based on the TJA1043T transceiver which is fully ISO 11898-2:2003 and ISO 11898-5:2007 compliant. It is suitable for 24V applications and capable to wake-up the hardware on bus traffic. A separate pin per CAN Signal is available for shielding of the CAN lines if necessary.

- Electric Strength: -58V … +58V

Caution
If a CAN channel is configured to work at 1Mbit/s the ECU cannot be woken up via that CAN channel at temperatures below -30°C.

6.2 Control Pilot

Low- and high-level communication between charging infrastructure and vehicle is performed via the CP line.

6.2.1 PLC

Powerline communication Functional Building Block based on the QCA7005 PHY suitable for communication with vehicle charging infrastructure based on ISO 15118.

Interface to the host is a SPI with supported boot from host.

6.2.2 PWM

Low level PWM modulated communication between charging infrastructure and vehicle via the CP line. It is based on a 1 kHz signal with an amplitude of ±12V according to IEC 61851 [4] and SAE J1772 [10].

- Meas. Range: -15V…+15V
- Sampling: 100 kHz
- Diagnostics: Short to battery

The Control Pilot input is capable to wake-up the hardware on communication.

The vehicle can indicate readiness for charging with or without ventilation changing the positive amplitude of the signal. The charging infrastructure can indicate the available charging current by changing the duty cycle of the signal between 3% and 97%.

The following figure describes the recommended external wiring of CP and PE between the inlet and the VC-EVCC via a 2-core-twisted-pair cable.

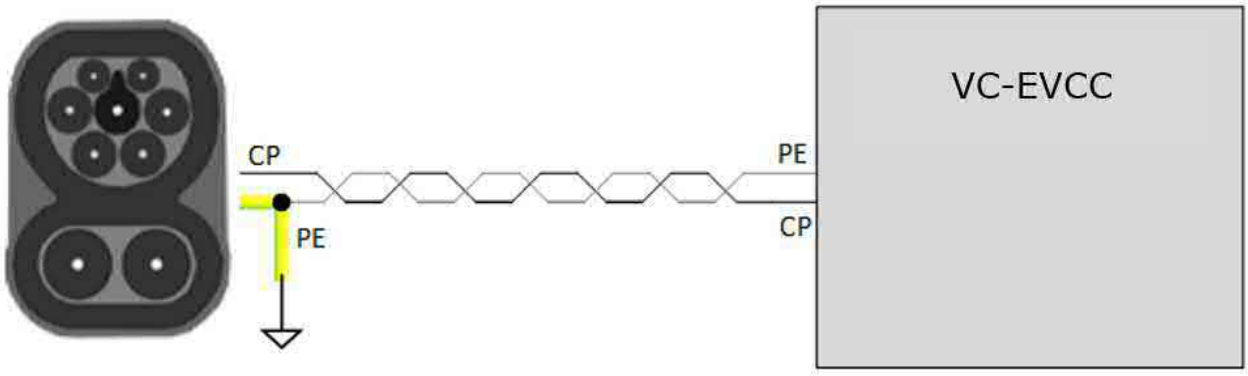


Figure 6-1 Recommended Wiring of CP and PE

6.2.3 LIN

A LIN communication with a data rate of 19.2 kbps between charging infrastructure and vehicle via CP line according to SAE J3068 [9] is available.

6.3 Proximity Detection Logic (Plug Present)

A Functional Building Block to detect whether a charging cable is connected and to determine the current load capacity of the connected cable. The FBB reads different resistor values representing different currents the charging infrastructure is capable of and is also capable to wake-up the hardware on communication. The implementation is according to IEC 61851 [4] and SAE J1772 [10].

- Meas. Range: 100Ω … 1500Ω based on a vehicle inlet resistor of 4700Ω or 2700Ω
- Pull up resistance: 330Ω
- Filter: Lowpass (200Hz corner frequency)
- Accuracy: According to IEC 61851 and SAE J1772
- Diagnostics: Open Load
  Short to Ground
  Short to Battery
  Out of Range

6.4 PT1000 Temperature Sensor Input

An analog input to connect PT1000 temperature sensors to it. A constant current source is used to supply the temperature dependent sensor. The resulting voltage drop can be measured at an ADC input of the µC.

- Meas. Range: -50°C … +150°C (800Ω … 1,6kΩ)
- Meas. Current: 1mA

- Resolution: 12bit ADC input
- Tolerance: ±5°C between -50°C … +150°C
  ±4°C between -30°C … +90°C
- Diagnostics: Open Load
  Short to Ground
  Short to Battery

6.5 Digital Input 0…V_{Bat}

The Digital Input FBB is a wake-up capable input with a separate current source for ground switching push buttons and can be used for a charging stop switch.

- Input type: Low active
- Input voltage: 0…V_{Bat}
- Diagnostics: Short to battery
- Pull up current: 2mA…3.6mA
- Filter: Lowpass (1060Hz corner frequency)
- Threshold voltage: typ. 1,65V
- Threshold resistance: ≤ 400Ω (active)
  ≥ 1200Ω (inactive)

The following figure shows the schematic of the Digital Input (charging stop switch).

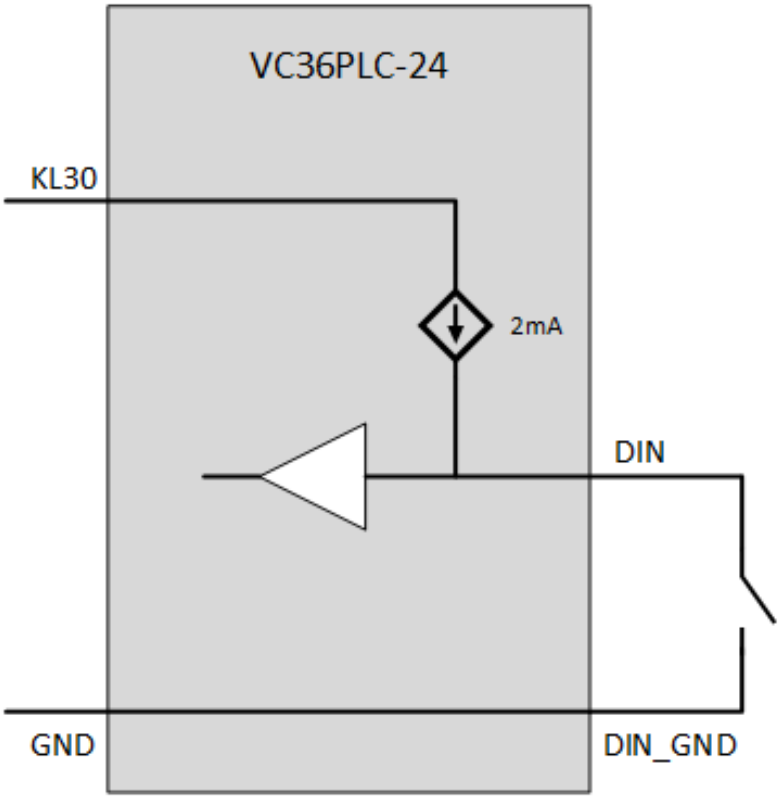


Figure 6-2: Digital Input Schematic

6.6 5A High-Side Output

Caution
If the VC-EVCC suffers from an unintentional GND contact loss, the freewheeling diode inside HSOUT4 may lead to an unexpected flow of current from HSOUT4 via its external load to GND.

As this may lead to undefined behavior of the external load (e.g. a BMS relay), the usage of HSOUT4 must be considered with care.

If in doubt, please contact the Vector support.

The 5A High-Side Output can be used as a digital output. The FBB is suitable for 24V applications to drive different loads such as lamps, contactors, relays, or to power other ECUs.

For diagnostics the Functional Building Block also implements a current and a voltage read back channel. It can be used as a digital or analog input as a population variant.

- Nominal voltage: 24V
- Max current: 5A
- Voltage drop: ≤ 0.4V
- Switching freq.: static on-off / up to 400Hz

- Diagnostics: Open Load in on state (min. 330mA load required)
  Open Load in off state (min. 50mA load required)
  Short to battery in off state
  Short to Ground in on state

6.7 5A H-Bridge

This FBB represents an H-bridge to drive motor applications such as a latch where a change in the motor direction is necessary. The FBB is capable of active freewheeling and diagnosis in on and off state.

- Nominal voltage: 12V for V_{Bat} ≥14V
  >V_{Bat} - 2V for V_{Bat} <14V
- Max. current: 5A
- Switching freq.: Static on-off
- Diagnostics: Open Load
  Short to Ground
  Short to Battery
  Short between Pins

6.8 Latch Position Input

This analog input FBB determines the latch state of the inlet connector by measuring the resistor values representing different latch states (unlocked, locked).

- Meas. range: 1kΩ (unlocked)
  11kΩ (locked)
- Pull up resistance: 7.5kΩ
- Accuracy: ± 10%
- Diagnostics: Open Load
  Short to Ground
  Short to Battery
  Out of Range

6.9 20mA LED Output

This LED Output FBB is a constant current LED driver with three channels. Dimming can be done via PWM up to 200Hz.

- Output current: 20mA
- Switching freq.: static on-off / up to 200Hz

- Diagnostics: Open Load (limited for V_{Bat} < 22V)
  Short to ground (limited for V_{Bat} < 22V)
  Short to battery

Diagnosis is only possible during on state. Furthermore, the following conditions are mandatory in order to ensure all diagnostic functionalities of the LED outputs.

- Minimum voltage drop at the LED (including external circuit): 5V
- Maximum voltage drop at the LED (including external circuit): V_{BAT} – 3V
- Maximum voltage drop at the LED (including external circuit): 14V

Note
The maximum voltage drop depends on the system's power supply voltage. In 24V systems the maximum voltage drop at the LED is 14V. In 12V systems the maximum voltage drop at the LED is V_{Bat} – 3V.

The following figure shows the schematic of the LED outputs.

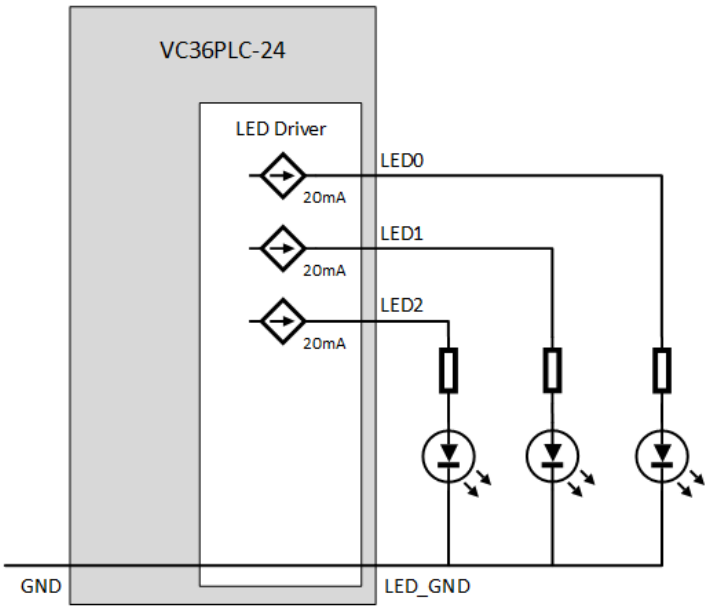


Figure 6-3: LED Outputs Schematic

Caution
The circuit of the LED outputs is designed for the usage of an external LED and a series resistance. Illuminants with internal constant current sources are not supported. Please note that the VC-EVCC has a separate ground pin (pin 4E) for the LED outputs.

6.10 Real Time Clock

An unbuffered real time clock with timer and calendar functions. Alarm and timer functions can additionally trigger a wake-up signal. The FBB ensures that the wake event can be read by the µC after wake-up.

6.11 200mA High-Side Output

Caution
If the High Side Outputs of the VC-EVCC are used, measures must be taken to ensure a load current greater than 15mA (HSOUT0, HSOUT1) respectively 330mA (HSOUT4).

An appropriate load resistor must be calculated depending on the supply voltage. Otherwise, the VC-EVCC will detect an OpenLoad error which leads to a switch-off of the High Side Output.

If in doubt, please contact the Vector support.

Digital Output for currents up to 200mA, used to drive small loads or as a status output for other ECUs. The outputs have various optional configurations. Each of them can be used as digital or analog inputs as a population variant.

- Nominal voltage: 24V
- Max. current: 200mA
- Switching freq: static on-off / up to 400Hz
- Diagnostics: Open Load (min. 15mA load required and $V_{Bat} \geq 10V$)
  Short to Ground
  Short to Battery

6.12 Terminal 15 Signal Input

The VC-EVCC has a Terminal 15 input to wake-up the ECU.

- Nominal voltage: 24V
- Input signal range: 0V…36V
  Low: ≤ 3.5V
  High: ≥ 4.5V
  Wake threshold: > V_{Bat} – 2.5V
- Filter: Lowpass (870Hz corner frequency)

6.13 Core

The Core FBB is defined by the microcontroller the external Watchdog and the supply of the electronics.

- Microcontroller: SPC564B74L7C9EC
  Up to 120Mhz with a 32-bit e200z4d Power Architecture® core
  3MB Flash and 192KB RAM
- Watchdog: Window Watchdog TPS3813-Q1K33
- Supply: 8 … 32 VDC

6.14 Sensor Supply

The sensor supply FBB is a 5V high side output for external sensors. It can be switched by the Core.

- Output voltage: 5V ± 3%
- Max current: 70mA

6.15 Miscellaneous

- PCB
  - 6 layers
  - PCB size, 120mm x 80mm
  - No conformal coating

- Quiescent Current (typ. / max.):
  - Without Inlet
    203µA / 324µA
  - With 4.7kΩ Inlet
    994µA / 1,2mA (with Inlet)
    3,61mA / 4,10mA (with 1.5kΩ within the charging cable)
    11,88mA / 12.53mA (with 100Ω within the charging cable)
  - With 2.7kΩ Inlet
    1,84mA / 2,16mA
    4,06mA / 4,58mA (with 1.5kΩ within the charging cable)
    11,92mA / 12,57mA (with 100Ω within the charging cable)

7 Mechanical Characteristics

This section describes the housing and connector of the VC-EVCC.

- Material: Die cast housing: ADC12
  Metal sheet cover: AlMg3 (EN AW 5754)
- Connector: Molex CMC 36 Hybrid sealed
- Size: 156 x 145 x 40 mm
- Weight: 455g (560g ± 5% including PCB)
- IP protection class: IP6K6K / IP6K7 / IP6K9K
  (not valid for unsealed evaluation hardware)
- Mounting: 23550 mm² / 3 x M6

7.1 Connector

The following table lists the mating connector for the wiring harness and its necessary parts:

Housing	MOLEX, 0643202311	
Wire Cap	MOLEX, 0643201301	
Contacts	MOLEX, 0643221019	0,635mm Terminal 0,35mm²
	MOLEX, 0643221039	0,635mm Terminal 0,50mm²
	MOLEX, 0643231029	1,5mm Terminal 1,0mm²
	MOLEX, 0643231039	1,5mm Terminal 2,0mm²
Blind Plug	MOLEX, 0643251010	0,635mm
	MOLEX, 0643251023	1,5mm

Table 7-1 Mating Connector

Caution
The MOLEX connector does not provide sufficient protection against intruding water. It is recommended by Vector to perform a risk assessment if additional measures are necessary to protect the MOLEX connector.

8 Device Installation

Directly install the device using three M6 hex socket head screws with a minimum engagement length of 7.2 mm. Tighten the installation screws with a torque of M = 9.5 – 11.5 Nm. It is recommended to use spring washers or lock washers to secure the screws.

In general, the following minimum requirements for fastening the VC-EVCC to the vehicle must be observed.

- Screw connection: M6
- Minimum engagement length of 7.2 mm in a steal thread/ nut M6 DIN934
- Strength class screw: 8.8
- Tightening torque: 9.5 – 11.5 Nm

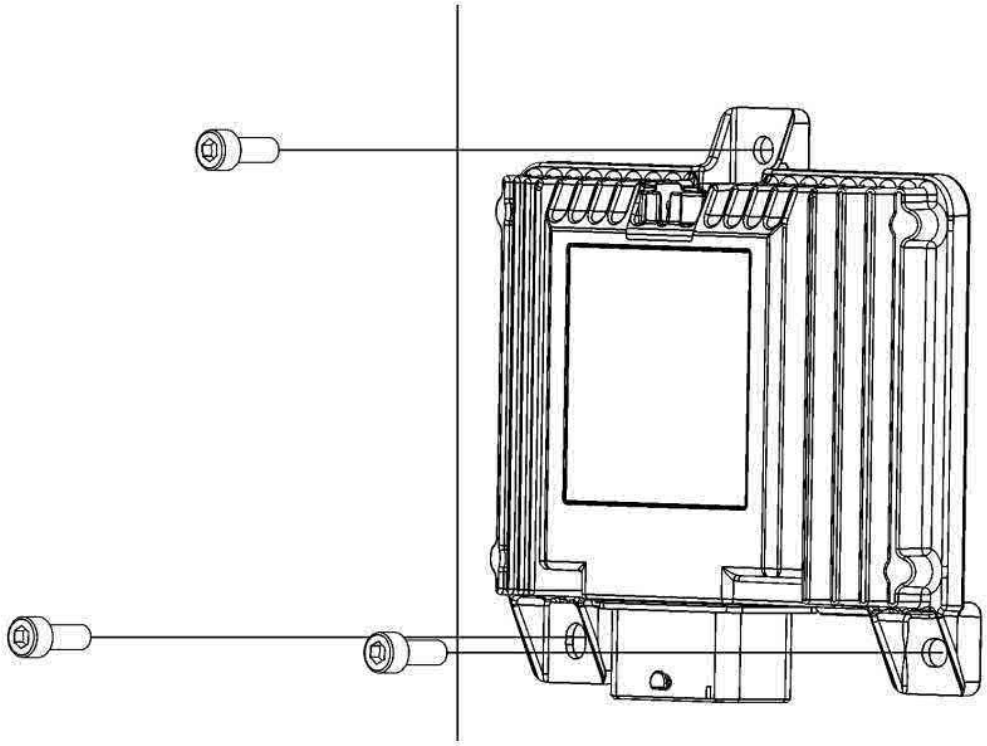


Figure 8-1: Installation

The following illustration shows the recommended installation positions of the VC-EVCC relative to the vehicle coordinate system.

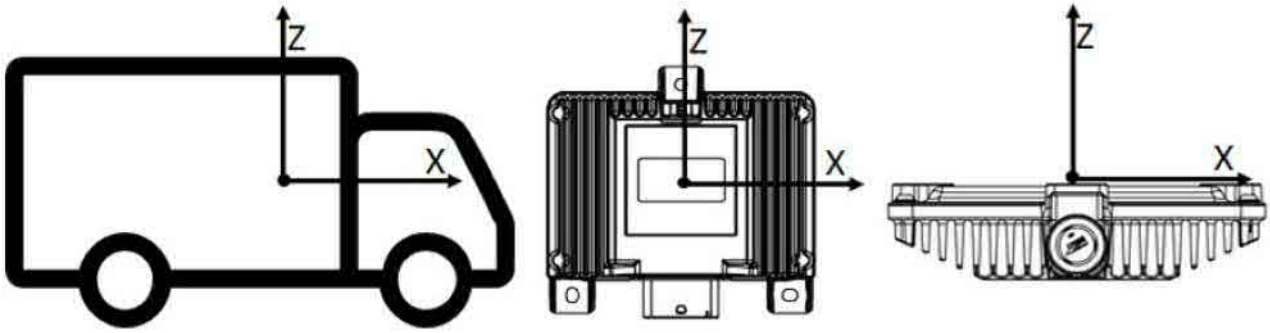


Figure 8-2: Environmental Tested Installation Positions of the VC-EVCC

Note
Please note that all mechanical and environmental tests were performed in the installation positions shown in the figure above. Therefore, all information about qualification of the VC-EVCC is only valid for these installation positions.

9 Support, Aftersales, Return Material and Replacement

For any inquiries of this chapter, please feel free to contact our product experts directly or through your sales representative:

- support@vector.com
- Online via http://vector.com/support/

9.1 Support

Vectors' support for the VC-EVCC is provided free of charge via E-Mail, Phone and Web. All questions related to the product are welcome to be asked.

In case of a technical issue while commissioning the ECU, we may ask you to provide us with your trace file for analyzation. Please share this with us to be able to respond as efficient as possible. Trace files can be shared with Vector in any of the following formats:

> .asc

> .blf

> .mf4

> .trc

> .xml

> .pcap / .pcapng

> .csv

> .mat

> .mdf

If the problems can't be solved online, Vector can provide onsite commissioning. Please contact your sales representative for detailed information.

9.2 Aftersales, Return Material and Replacement

In the unlikely event of a defective ECU, we will support with our aftersales, return material and replacement procedure.

1. A support case must be created through the contact forms mentioned at the beginning of this chapter
2. Your request will be aligned to a support case with a unique tracking number, e.g. CS1234567. You can follow all details to this case online.
3. The technical support verifies whether a return shipment of the controller is necessary. In case of a positive outcome, you will receive a Return Material Allowance.
4. With the Return Material Allowance, you will be asked to provide:
    a. The serial number of the defective device

b. The delivery note number
c. The sender’s name
d. An error description
e. Error protocols and/or error log files

Note: Return shipment will be at your expenses.

5. The defective unit will then be analyzed and reported back to you. After the analysis of the defect at Vector and definition of the next steps, we will either send you the unit back (in case of No Warranty issue) or replace the defective unit. A refund or a credit voucher is not foreseen. Please allow us a maximum of 15 to 20 working days of time between receiving your unit, checking the defects and define the next steps to proceed.

To avoid any delays in the above-mentioned scenario, we recommend holding a replacement unit for series production on your stock.

9.2.1 Warranty Regulation

The warranty regulation is available in the contractual documents.

10 Appendix

10.1 Pin Allocation

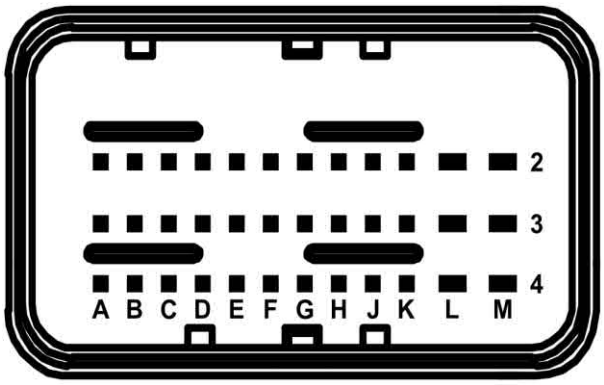


Figure 10-1 Connector Drawing

Pin	Name	Function	Assignment	EV-T1GBIE12… EV-T2GBIE12…
2A	PTC0	Analog IN Threshold	PTC AC	AC-Temp + (VT)
2B	VCC_SS	Sensor-Supply 5V	Not Used	-
2C	CAN0_H	High Speed CAN	Diagnostic CAN	-
2D	CAN0_L	High Speed CAN	Diagnostic CAN	-
2E	CAN1_H	High Speed CAN	J1939 Vehicle CAN	-
2F	CAN1_L	High Speed CAN	J1939 Vehicle CAN	-
2G	CAN2_H	High Speed CAN	Not Used	-
2H	CAN2_L	High Speed CAN	Not Used	-
2J	CP	Control Pilot	Control Pilot	CP (WH)
2K	PP	Proximity Pin	Proximity Detection	PP (WHBU)
2L	PE	Protected Earth	PE	PE (GNYE)
2M	GND	ECU Ground	Terminal 31	-
3A	PTC1	Analog IN PT1000	PT1000 DC+	DC-Temp+ (YE)
3B	SS_GND	Analog Ground	GND PT1000	DC-Temp- (YEBN) AC-Temp- (VTBN) GND Pos. FB (BU/YE)
3C	CAN0_SHIELD 0	CAN Shield	Diagnostic CAN	-
3D	CAN0_SHIELD 1	CAN Shield	Diagnostic CAN	-
3E	CAN1_SHIELD 0	CAN Shield	J1939 Vehicle CAN	-
3F	CAN1_SHIELD 1	CAN Shield	J1939 Vehicle CAN	-
3G	CAN2_SHIELD 0	CAN Shield	Not Used	-
3H	CAN2_SHIELD 1	CAN Shield	Not Used	-
3J	HS_OUT0	High Side Out 200mA	High Side Output 0	-
3K	HS_OUT1	High Side Out 200mA	High Side Output 1	-
3L	FB_OUT0	Full Bridge 12V	Plug Lock +	+ (BU/RD)
3M	FB_OUT1	Full Bridge 12V	Plug Lock -	- (BU/BN)
4A	PTC2	Analog IN PT1000	PT1000 DC-	-

4B	POS_FB	Lock Position	Position Detection	(BU/GN)
4C	DIN_GND	DIN Ground	Charging Stop Switch GND	-
4D	DIN	Digital Input	Charging Stop Switch	-
4E	LED_GND	LED Ground	LED GND	-
4F	LED0	LED Output 20mA	Status LED	-
4G	LED1	LED Output 20mA	Status LED	-
4H	LED2	LED Output 20mA	Status LED	-
4J	HS_OUT2	High Side Out 200mA	Generic Switch Input	-
4K	CLAMP 15	Terminal 15 Signal Input	Terminal 15 Wake Input	-
4L	HS_OUT4	High Side Out 5A	High Side Output 4	-
4M	VCC_KL30	ECU Supply	Terminal 30	-

Table 10-1 Pin Allocation Table

10.2 CAN Signals and Messages

Reference

An overview of the relevant CAN signals and messages is included in the provided CAN database which can be found in the delivered folder via the following link: Release_3_0_0\CANoe\Database.

10.3 Diagnostic Trouble Codes (DTC)

DTC	SPN	FMI	Fault Source Name	Fault Description
0x00E0E3	7E000	3	Control Pilot	Short to VBat
0x01E0E4	7E001	4	Proximity Pin	Short to GND
0x01E0E3	7E001	3	Proximity Pin	Short to VBat
0x01E0E5	7E001	5	Proximity Pin	Open load
0x01E0E2	7E001	2	Proximity Pin	Out of range
0x02E0E4	7E002	4	Position Feedback	Short to GND
0x02E0E3	7E002	3	Position Feedback	Short to VBat
0x02E0E5	7E002	5	Position Feedback	Open load
0x03E0E6	7E003	6	Full Bridge 12V	Short to GND
0x03E0E3	7E003	3	Full Bridge 12V	Short to VBat
0x03E0E4	7E003	4	Full Bridge 12V	Short between pins
0x03E0E5	7E003	5	Full Bridge 12V	Open load
0x04E0E3	7E004	3	Charging Stop Switch (DIN)	Short to VBat
0x05E0E2*	7E005	2	PTC0	Out of range
0x05E0E4*	7E005	4	PTC0	Short to GND

0x05E0E3*	7E005	3	PTC0	Short to VBat
0x05E0E5*	7E005	5	PTC0	Open load
0x06E0E4*	7E006	4	PTC1	Short to GND
0x06E0E3*	7E006	3	PTC1	Short to VBat
0x06E0E5*	7E006	5	PTC1	Open load
0x07E0E4*	7E007	4	PTC2	Short to GND
0x07E0E3*	7E007	3	PTC2	Short to VBat
0x07E0E5*	7E007	5	PTC2	Open load
0x0EE0EB	7E00E	0B	Diagnostic CAN (CAN0)	Bus off
0x0FE0EB	7E00F	0B	J1939 Vehicle CAN (CAN1)	Bus off
0x20E0E2	7E020	2	VCVCCU_ChargeFromVehicle	Message Timeout
0x20E0EA	7E020	0A	VCVCCU_ChargeFromVehicle	E2E Fault
0x21E0E2	7E021	2	VCVCCU_V2G_EVMaximumCurrentLimit	Message Timeout
0x22E0E2	7E022	2	VCVCCU_V2G_EVMaximumVoltageLimit	Message Timeout
0x23E0E2	7E023	2	VCVCCU_V2G_EVTargetCurrent	Message Timeout
0x24E0E2	7E024	2	VCVCCU_V2G_EVTargetVoltage	Message Timeout
0x25E0E2	7E025	2	VCVCCU_V2G_VehicleStatus	Message Timeout
0x26E0E2*	7E026	2	V2ICP_WrongConfiguration	Wrong Configuration
0x27E0E2*	7E027	2	V2ICP_CommunicationError	Communication Error
0x28E0E2*	7E028	2	VCVCCU_V2ICP_VehicleToBackend_Timeout	Message Timeout
0x29E0E2*	7E029	2	VD_Timeout	Message Timeout
0x2AE0E2*	7E02A	2	Plug and Charge Configuration Error	Wrong Configuration
0x2BE0E2	7E02B	2	Protective Earth (PE) to GND offset	Out of range
0x40E0E2	7E040	2	Hardware Software Incompatibility	Incompatibility
0x41E0E2*	7E041	2	VCVCCU_LIN_EvMaxMinCurrents	Timeout
0x42E0E2*	7E042	2	VCVCCU_LIN_EvMaxVoltageList	Timeout
0x43E0E2*	7E043	2	VCVCCU_LIN_EvMinVoltageList	Timeout
0x44E0E2*	7E044	2	VCVCCU_LIN_EvPresentCurrentList	Timeout
0x45E0E2*	7E045	2	VCVCCU_LIN_EvStatus	Timeout

Table 10-2 Diagnostic Trouble Codes

*DTC is only relevant if the feature is activated

11 Glossary and Abbreviations

11.1 Glossary

Term	Description
Functional Building Block	An electronic component representing a specific functionality. It consists not only of the schematic but also of further documentation.

11.2 Abbreviations

Abbreviation	Description
AC	Alternating Current
ADC	Analog to Digital Converter
AUTOSAR	AUTomotive Open System ARchitecture
BMS	Battery Management System
CAN	Controller Area Network
CCS	Combined Charging Standard
.cdd	CANdela Diagnostic Description File
CP	Control Pilot
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DC	Direct Current
DTC	Diagnostic Trouble Code
ECU	Electronic Control Unit
EVSE	Electric Vehicle Supply Equipment
FBB	Functional Building Block
HS	High Side
HW	Hardware
LED	Light Emitting Diode
LIN	Local Interconnect Network
µC	Microcontroller
PCB	Printed Circuit Board
PE	Protective Earth
PLC	Power Line Communication
PnC	Plug and Charge
PP	Proximity Pin / Plug Present
PTC	Positive Temperature Coefficient
PWM	Pulse-Width Modulation
RAM	Random Access Memory
RTC	Real Time Clock

SID	Service Identifier
SPI	Serial Parallel Interface
UDS	Unified Diagnostic Services
V2G	Vehicle-to-Grid
VAS	Value Added Services
VCU	Vehicle Control Unit
VC-EVCC	Vector Controller – Electric Vehicle Communication Controller

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