

## STSW-AUTODEVKIT - AutoDevKit Studio 2.4.0

### Introduction

This document is updated periodically to record [STSW-AUTODEVKIT](#) updates, known problems, and limitations.

AutoDevKit Studio 2.4.0 replaces the previous plugin zip file.

This new release offers an innovative way of delivering the AutoDevKit package: a unique zipped .exe includes SPC5 Studio with the AutoDevKit plugin already installed. This is only the first step for our new tool named AutoDevKit Studio.

A new Welcome page has been created in AutoDevKit Studio. This page contains three tabs:

- The first tab highlights the news about the AutoDevKit ecosystem. Each "tile" represents an update.
- The second tab contains the tutorial video links to learn about AutoDevKit by yourself.
- The third tab introduces AutoDevKit sample applications. By clicking on the sample application name, the system imports the related AutoDevKit Studio project. The Welcome page appears after installing the AutoDevKit Studio. You can always recover it through the Help > Welcome menu.

The installation package includes an open on-chip debugger (OpenOCD), which aims at debugging, in-system programming and boundary-scan testing for embedded target devices.

OpenOCD is available for SPC58x projects. To use it, you need to supply the .elf file generated after compiling the project. From hardware point of view, to download the code in the MCU flash or RAM, you can use the programmer hosted on the SPC58x discovery boards or the dongle board [AEK-MCU-SPC5LNK](#) (supporting OpenOCD).

For PLS UDE back compatible dongle, please have a look at [AEK-MCU-SPC5LNKU](#).



### License details

For most of the components, we have migrated the software license agreement from SLA0089 to SLA0098.

For further details, refer to [SLA0098](#).

### How to install AutoDevKit Studio

- |                |  |
|----------------|--|
| <b>Step 1.</b> | Download the zip file <a href="http://www.st.com/autodevkitsw">www.st.com/autodevkitsw</a> |
| <b>Step 2.</b> | Uncompress the zip file  |
| <b>Step 3.</b> | Launch the .exe file   |
| <b>Step 4.</b> | Accept the license   |
| <b>Step 5.</b> | Ignore warnings  |

**Table 1. STSW-AUTODEVKIT release summary**

Type	Summary
Minor release (version 2.4.0)	<p>New components:</p> <ul style="list-style-type: none"> <li> <b>AEK-POW-BMSCHAIN</b>            The AEK-POW-BMSCHAIN is a new driver tool that manages multiple instances of BMS chains with nodes based on a minimum of 4 to a maximum of 14 cells. You can compose the chain with any BMS node type (<a href="#">AEK-POW-BMS63EN</a>, <a href="#">AEK-POW-BMSNOTX</a> or <a href="#">AEK-POW-BMSWTX</a>) belonging to the AutoDevKit ecosystem. The AEK-POW-BMSCHAIN driver tool improves the timing of the acquisition routine for voltage current and temperature by implementing a cyclic conversion routine based on an SPI/ISOSPI burst command. The AEK-POW-BMSCHAIN driver tool also improves dual access ring chain topology: you can now attach and detach a single BMS node in real-time. The software package features State-Of-Charge (SoC) and State-Of-Health (SoH) estimation as well as a passive balancing algorithm.         </li> <li> <b>AEK-MCU-C4MINI1</b>            The AEK-MCU-C4MINI1 is designed to address Automotive and Transportation applications as well as other applications requiring automotive safety and security levels. The board layout has been conceived to speed up the user development offering an easy prototyping evaluation tool. Despite several connection possibilities due to the MCU numerous peripherals, the user-friendly interface facilitates the interconnection of pre-configured and pin pre-mapped peripherals. The general-purpose and serial connectors have been standardized and grouped by peripheral function types. The MCU peripherals are extended with the VNH7040AY embedded H-bridge motor driver for DC motor control, featuring advanced diagnostic features (short-to-ground, short-to-battery, and open load conditions). The top connection facilitates the debugging phase (for example, when testing signal connections and data exchange), while the bottom one reduces the total occupied space by the two boards, making it the preferred choice for deployment purposes.         </li> <li> <b>AEK-POW-BMSLV</b>            The <a href="#">AEK-POW-BMSLV</a> is a hardware tool that implements a BMS low voltage solution with 14 cells. It is based on the <a href="#">L9963E</a>, an automotive-grade AFE chip for battery management applications. The BMS node communicates with an MCU via ISOSPI protocol using the <a href="#">L9963T</a>. The AEK-POW-BMSLV includes a PMIC unit based on the <a href="#">SPSB100</a> (custom version with CAN port) that is able to provide supply voltage to the SPC58EC MCU.         </li> </ul> <p>Updated components:</p> <ul style="list-style-type: none"> <li> <b>AEK-POW-BMS63EN</b>            The <a href="#">AEK-POW-BMS63EN</a> is a hardware tool that implements a BMS node with a minimum of 4 to a maximum of 14 cells based on the <a href="#">L9963E</a>, an automotive-grade AFE chip for battery management applications. The software package includes a State-Of-Charge (SoC) and State-Of-Health (SoH) estimation as well as a passive balancing algorithm.         </li> </ul> <p>Updates:</p> <p>Bugfix on the Graphic User Interface for AEK-POW-BMS63EN demos</p>

Type	Summary
	<ul style="list-style-type: none"> <li> <b>AEK-AUD-D903V1</b>            The <a href="#">AEK-AUD-C1D9031</a> is a very compact AVAS solution based on the <a href="#">SPC582B60E1</a> Chorus family MCU and <a href="#">FDA903D</a> Class D audio amplifiers that emits warning sounds to alert pedestrians of the presence of e-vehicles. The <a href="#">AEK-AUD-C1D9031</a> integrates two audio amplifiers in stereo mode or two separate audio channels. The board compact size allows the designer to strategically place different modules around the vehicle to ensure that warning sounds can be heard along the entire vehicle length. All the modules can be controlled by a central MCU via CAN interface.         </li> </ul> <p>Updates:</p> <p>Bugfix: I2S signal generation in sync with the bit clock edge.</p>

## Customer support

For more information or help concerning AutoDevKit, contact the STMicroelectronics nearest sales office or visit AutoDevKit community under [community.st.com/autodevkit](https://community.st.com/autodevkit). For a complete list of STMicroelectronics offices and distributors, refer to the [www.st.com](http://www.st.com) webpage.

*Note: STMicroelectronics declines any responsibility regarding third-party components included in the library. No support is provided by STMicroelectronics. Please, contact the specific third-party component makers for relevant inquiries.*



## 1 General information

**AutoDevKit** library contains software components for functional boards. Each component has a specific API able to control the specific functional board. The API consists of a set of “methods”. Some of these are very high-end and simple to use even to the hardware inexperienced user. Other methods access more specific low-level board/chip functions able to exploit more advanced configurations and features.

**AutoDevKit** components are provided with a graphical user interface for easy configuration and set-up. The peripherals and pins configuration and allocation is automatically performed with a simple button-press action. In the same library, simple demo examples of component usage are provided.

All components have online help available with details related to usage and available APIs.

### 1.1 System requirements

- Installation of STSW-AUTODEVKIT from [www.st.com/autodevkitsw](http://www.st.com/autodevkitsw) (AutoDevKit Studio IDE)
- **AEK-MCU-SPC5LNK** debugging software for OpenOCD debugger
- **Microcontroller** board(s)
- **Functional** board(s)
- Connector board(s) – if required by the project

### 1.2 Disclaimer

Software is provided for free “as is”. The code provided is only to demonstrate functionalities and it is not industrialized. STMicroelectronics shall not hold any responsibility for the usage and misuse of the code provided. STMicroelectronics bears no liabilities in case the code (or part of it) is used for demonstrators or prototypes or commercial products. STMicroelectronics bears no liabilities in case the code contains bugs that could impact developers and/or final customers. STMicroelectronics bears no liabilities for third party code included in the library.

## 2 Recent AutoDevKit updates

### 2.1 Known limitations

- Demo for [AEK-POW-L5964V1](#) for USB-PD is pin-out fixed and configuration is compatible only with [AEK-MCU-C4MLIT1](#) and [SPC58EC-DISP](#) boards.
- Demo for [AEK-POW-L5964V1](#) for adjustable DC-DC pin-out is not fixed but API functionalities are limited.

### 2.2 Supported microcontroller boards

- [AEK-MCU-BRNLIT1](#) - Light version discovery board for SPC58xNx (Bernina)
- [AEK-MCU-C4MLIT1](#) - Light version of [SPC58EC-DISP](#)
- [AEK-MCU-C1MLIT1](#) - Light version of [SPC582B-DIS](#)
- [AEK-MCU-C4MINI1](#) - SPC58EC with pre-allocated pins
- [SPC58EC-DISP](#) - Discovery board for SPC58EC MCU with extended connectivity
- [SPC584B-DISP](#) - Discovery board for SPC584B MCU with extended connectivity
- [SPC582B-DIS](#) - Discovery board for SPC582B MCU with Arduino™ connector
- [SPC584B-DIS](#) - Discovery board for SPC584B MCU with Arduino™ connector
- [SPC58EC-DIS](#) - Discovery board for SPC58EC MCU with Arduino™ connector

### 2.3 Supported connector boards

- [AEK-CON-AFLVIP2](#) (NRND) - Adaptive Front-Lighting connector board with EV-VNx7x slot
- [AEK-CON-5SLOTS1](#) (NRND) - Connector board for discovery boards with 4x37 connector allowing pin re-arranging and re-ordering
- [AEK-CON-BSPOTV1](#) (NRND) - Connector dedicated to detection in blind-spot application educational tool
- [AEK-CON-SENSOR1](#) - Connector board for SPC5 MCU discovery boards and MEMS sensor boards in DIL 24 socket

### 2.4 Bug fixed

As shown in [Table 1. STSW-AUTODEVKIT release summary](#).

### 3 Previous versions

**Table 2. STSW-AUTODEVKIT release history**

Type	Summary
Minor release (version 2.2.1)	<p>Updated components:</p> <ul style="list-style-type: none"> <li>• <b>SPC582B-DIS</b> The discovery board SPC582B-DIS helps you to discover SPC582B Line Power Architecture® Microcontrollers with full access to CPUs, I/O signals and peripherals at budget price. Bug Fix: Missing demo example</li> <li>• <b>SPC584B-DIS</b> The SPC584-DIS is the ideal discovery board for accelerating the development and securing a fast time-to-market, with a perfect balance among performances, functionalities and cost. Bug Fix: Missing demo example</li> <li>• <b>SPC58EC-DIS</b> The SPC58EC-DIS is the ideal discovery board for accelerating development and securing a fast time-to-market, with a perfect balance among performances, functionalities and cost. Bug Fix: Missing demo example</li> </ul>
Minor release (version 2.2.0)	<p>New components:</p> <ul style="list-style-type: none"> <li>• <b>AEK-POW-BMSWTX</b> It is a hardware tool that implements a BMS node based on the L9963E with an integrated L9963T ISOSPI &lt;-&gt; SPI transceiver on board. The node supports from 4 up to 14 cells. Both ICs are automotive-grade. The BMS node communicates with an MCU via the ISOSPI protocol using the L9963T. The software package includes a State-Of-Charge (SoC) and State-Of-Health (SoH) estimation as well as a passive balancing algorithm.</li> <li>• <b>AEK-POW-BMSLV</b> It is a one board hardware tool implementing a BMS low voltage solution (&lt;60V). It is based on the L9963E, an automotive-grade AFE, L9963T ISOSPI &lt;-&gt; SPI transceiver, a PMIC unit based on the SPSB100 to provide supply voltages, and a main controller MCU SPC58EC .</li> <li>• <b>AEK-SNS-ASM330LHB</b> It is a hardware tool based on STEVAL-MKI236A, an adapter board to facilitate the evaluation of MEMS devices in the ASM330LHB product family. The ASM330LHB is a system-in-package featuring a 3-axis digital accelerometer and a 3-axis digital gyroscope with an extended temperature range up to +105 °C. The software package allows controlling sensor devices by implementation of I2C or SPI 4-wire communication protocols.</li> <li>• <b>AEK-POW-SPSB081</b> It is a hardware tool based on SPSB081, a power management system IC providing electronic control modules with enhanced power management functionality, including various standby modes to minimize the power consumption with programmable local and remote wake-up capability, as well as LIN and CAN FD physical communication layers.</li> <li>• <b>AEK-MCU-SPC5LNK</b> It is a debugger/programmer dongle for SPC5 automotive microcontrollers. It consists of a passive USB-to-JTAG debugger and programmer, which provides a cost-effective, small-size, and fast-prototyping solution for any vehicle applications. This dongle is fully integrated into SPC5-Studio and AutoDevKit Studio IDEs. The JTAG interface ensures an easy plug to any SPC58 family automotive microcontroller boards. In addition a virtual COM port interface enables the host PC to communicate with the microcontroller through UART.</li> </ul> <p>Updated components:</p> <ul style="list-style-type: none"> <li>• <b>AEK-MOT-2DCxxx</b> The AEK-MOT-2DC70S1 and AEK-MOT-2DC40Y1 are very compact solutions for multi DC motor driving applications embedding all the driver and signal decoding functions on the same board. Updates: SPC58ECxx_RLA AEK_MOT_2DCxxx Main ECU - Seat Adj Control demo removed</li> </ul>

Type	Summary
	<ul style="list-style-type: none"> <li data-bbox="655 315 1473 465"> <p>• <b>AEK-POW-BMS63EN</b>            It is a hardware tool that implements a BMS node with a minimum of 4 to a maximum of 14 cells based on the L9963E, an automotive-grade AFE chip for battery management applications.            Updates:            Bugfix in SPC58NN Bernina demo applications</p> </li> <li data-bbox="655 472 1473 667"> <p>• <b>AEK-COM-ISOSPI1</b>            This component enables the L9963T, a general purpose SPI to isolated SPI transceiver intended to create a communication bridge between devices located at distance and into different voltage domains. L9963T is able to transfer communication data incoming from a classical 4-wire based SPI interface to a 2-wire isolated interface (and vice versa).            Updates:            Bugfix in the available demos</p> </li> <li data-bbox="655 674 1473 875"> <p>• <b>AEK-AUD-D903V1</b>            It is a very compact AVAS solution based on the SPC582B60E1 Chorus family MCU and FDA903D Class D audio amplifiers that emits warning sounds to alert pedestrians of the presence of e-vehicles. The AEK-AUD-D903V1 integrates two audio amplifiers in stereo mode or two separate audio channels. The board can be controlled by a central MCU via CAN interface.            Updates:            Bugfix in the driver</p> </li> <li data-bbox="655 882 1473 1084"> <p>• <b>AEK-LCD-ILI9341</b>            This component is dedicated to a commercially available touch LCD display 240x320 pixels with up to 65K colors per pixel based on the ILI9341 controller. The touch circuit is managed by the XPT2046 controller. All communications are based on the SPI protocol. It is possible to manage up to two LCDs in parallel.            Updates:            Bugfix in the driver</p> </li> <li data-bbox="655 1090 1473 1292"> <p>• <b>AEK-LCD-LVGL</b>            LVGL (Light and Versatile Graphics Library) is a popular free and open source embedded graphics library to create nice UIs for any MCU. This LVGL porting allows creating graphics on our AEK-LCD-ILI9341 LCD touch component. Note that the component is visible only if you have added and configured the AEK-LCD-ILI9341.            Updates:            Bugfix in the driver</p> </li> </ul>
Minor release (version 2.1.0)	<p>New components:</p> <ul style="list-style-type: none"> <li data-bbox="655 1346 1473 1503"> <p>• <b>AEK-POW-BMS63EN</b>            The AEK-POW-BMS63EN is a hardware tool that implements a BMS node with a min. of 4 to a max. of 14 cells based on the L9963E, an automotive-grade AFE chip for battery management applications.            The software package includes a State-Of-Charge (SoC) and State-Of-Health (SoH) estimation as well as a passive balancing algorithm.</p> </li> <li data-bbox="655 1509 1473 1680"> <p>• <b>AEK-MOT-MR200G1</b>            The AEK-MOT-MR200G1 is designed as a mini zone controller for the side mirror application. The AEK-MOT-MR200G1 hosts an SPC582B60E1 Chorus 1M microcontroller and an L99DZ200G automotive-grade multi-output driver. Thanks to the integrated L99DZ200G, the board allows controlling different functions related to a vehicle side mirror: folding, unfolding, X-Y mirror inclination, electrochromic dimming, and heating.</p> </li> </ul>

Type	Summary
	<p>Updated components:</p> <ul style="list-style-type: none"> <li>• <b>AEK-LCD-ILI9341</b> (updated)            This component is dedicated to a commercially available touch LCD display 240x320 pixels with up to 65K colors per pixel based on the ILI9341 controller. The touch circuit is managed by the XPT2046 controller. All communications are based on the SPI protocol. It is possible to manage up to two LCDs in parallel. The LCD is implemented in the AutoDevKit board AEK-LCD-DT028V1.            Update:            Bugfix in the driver</li> <li>• <b>AEK-COM-ISOSPI1</b> (upgraded)            This component enables the L9963T functions. L9963T is a general purpose SPI to isolated SPI transceiver intended to create a communication bridge between devices located at distance and into different voltage domains. L9963T is able to transfer communication data incoming from a classical 4-wire based SPI interface to a 2-wire isolated interface (and vice versa).            Updates:            Bugfix in the driver            Update GUI configuration</li> <li>• <b>AEK-MOT-2DCxxx</b> (updated)            The <b>AEK-MOT-2DC70S1</b> and <b>AEK-MOT-2DC40Y1</b> are very compact solutions for multi DC motor driving applications embedding all the driver and signal decoding functions on the same board.            Update:            Bugfix in the driver</li> <li>• <b>AEK-LCD-LVGL</b> (upgraded)            LVGL (Light and Versatile Graphics Library) is a popular free and open source embedded graphics library to create nice UIs for any MCU. This LVGL porting allows creating graphics on our AEK-LCD-ILI9341 LCD touch component. Please note that the component is visible only if you have added and configured the AEK-LCD-ILI9341.            Update:            Bugfix in the driver</li> <li>• <b>Digital Twin Application (NewTwen)</b> (updated)            Digital Twin (DT) technology is a Motor Control Kit with digital sensors for motor internal temperature detection where physical sensors cannot be placed. The purpose of this demo is to show an application of Digital Twin (DT), designed and implemented by NEWTWEN. The following devices are required:  <a href="#">AEK-MOT-3P99081</a> board  <a href="#">AEK-MCU-C4MLIT1</a> board            Brushless DC (BLDC) motor</li> </ul> <p>Update:            Bugfix in the driver</p> <p>Not recommended for new design (NRND) components:</p> <ul style="list-style-type: none"> <li>• <b>AEK-POW-100W4V1</b>: board in Mat50 (NRND).</li> <li>• <b>AEK-POW-L5964V1</b>: board in Mat50 (NRND).</li> <li>• <b>AEKD-USBTYPES1</b>: USB Power delivery demo kit in Mat50 (NRND).</li> <li>• <b>AEK-CON-5SLOTS1</b>: board in Mat50 (NRND).</li> <li>• <b>AEK-CON-AFLVIP2</b>: board in Mat50 (NRND).</li> <li>• <b>AEK-CON-BSPOTV1</b>: board in Mat50 (NRND).</li> <li>• <b>AEKD-AFL001</b>: Adaptive Front-Lighting kit in Mat50 (NRND).</li> <li>• <b>AEKD-AFLPANEL1</b>: Adaptive Front-Lighting kit in Mat50 (NRND).</li> <li>• <b>AEKD-AFLLIGHT1</b>: Adaptive Front-Lighting kit in Mat50 (NRND).</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <b>SPC58NN84E7</b> Chorus line, triple core 200MHz, 6 Mb flash memory, HSM, GTM, ASIL-D</li> <li>• <b>SPC58EC80E5</b> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <b>SPC584B70E5</b> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <b>SPC582B</b> Chorus line, single core 80 MHz, 1 Mb flash memory</li> </ul>



Type	Summary
Major release (version 2.0.0)	<p>New components:</p> <ul style="list-style-type: none"> <li>• <b>AEK-POW-LDOV02J</b> The L99VR02J is a DC-DC voltage regulator designed for automotive applications (AEC-Q100 qualified). It can deliver up to 500mA of load current and consumes as low as 1µA when the regulator is disabled.</li> <li>• <b>AEK-LCD-LVGL</b> LVGL (Light and Versatile Graphics Library) is a popular free and open source embedded graphics library to create beautiful UIs for any MCU. This LVGL porting allows to create graphics on our AEK-LCD-IL19341 LCD touch component. Please note that the LVGL component is only visible if you have added and configured AEK-LCD-IL19341</li> <li>• <b>AEK-MCU-BRNLIT1</b> The component supports the SPC58xNx microcontroller (aka Bernina) belonging to a family of devices superseding the SPC5x family. Taking advantage from the legacy of the SPC5x family, SPC58xNx introduces new features coupled with higher throughput to provide substantial reduction of cost per feature and significant power and performance improvement (MIPS per mW)</li> <li>• <b>AEK-COM-ISOSPI1</b> This component enables the L9963T functions. L9963T is a general purpose SPI to isolated SPI transceiver intended to create a communication bridge between devices located at distance and into different voltage domains. L9963T is able to transfer communication data incoming from a classical 4-wire based SPI interface to a 2-wire isolated interface (and viceversa)</li> </ul>
Minor release (version 1.7.0)	<p>New components:</p> <ul style="list-style-type: none"> <li>• <b>AEK-POW-LDOV01J and AEK-POW-LDOV01S</b> The L99VR01x is a DC-DC voltage regulator designed for automotive applications (AEC-Q100 qualified). It can deliver up to 200 mA of load current and consumes 1 µA when the regulator is disabled.</li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>• <b>AI-Car sensing node</b> This application demonstrates how to use Core2 and Core0 simultaneously. It implements a versatile deep learning system based on the long-short term memory (LSTM) recurrent neural network (RNN) able to provide a car state classification:           <ul style="list-style-type: none"> <li>– car parked</li> <li>– car driving on normal conditions road</li> <li>– car driving on a bumpy road</li> <li>– car skidding or swerving</li> </ul>           The main idea is to define a sensing node ECU with an embedded artificial intelligence processing, namely an AI-Car sensing node. The system hosts an SPC58EC Chorus 4M microcontroller able to acquire discrete acceleration variations on a three-axis reference system. The inertial data are retrieved by the <b>AIS2DW12</b> motion sensor mounted on the <b>AEK-CON-SENSOR1</b> board. The acquired data is passed to an LSTM RNN able to classify the car state. The result of the classification is shown on an LCD Touch display contained in the <b>AEK-LCD-DT028V1</b> board. LSTM RNN has been implemented and trained using the TensorFlow 2.4.0 framework (Keras) on the Google Colab environment. The resulting trained neural network has been converted by the <b>SPC5-STUDIO-AI</b> plug-in in an optimized C code library capable of running on an MCU with limited power computing resources.         </li> </ul> <p>Updated component(s):</p> <ul style="list-style-type: none"> <li>• EV-VNx7xxx: Bugfix in the driver</li> <li>• EV-VNHx7xxx: Bugfix in the driver</li> <li>• Linear-Hall-Effect-Sensor: Bugfix in the driver</li> </ul> <p>Not recommended for new design (NRND) components:</p> <ul style="list-style-type: none"> <li>• AEK-POW-100W4V1: board at maturity 50</li> <li>• AEK-POW-L5964V1: board at maturity 50</li> <li>• AEKD-USBTYPPEC1: USB Power Delivery evaluation kit at maturity 50</li> </ul>

Type	Summary
Minor release (version 1.6.0)	<p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <a href="#">SPC58EC80E5</a> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <a href="#">SPC584B70E5</a> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <a href="#">SPC582B</a> Chorus line, single core 80 MHz, 1 Mb flash memory</li> </ul> <p>Components updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-MOT-2DCxxx</a> - Bugfix in the driver</li> <li>• <a href="#">AEK-CON-SENSOR1</a> - Bugfix in the driver</li> <li>• <a href="#">AEK-SNS-VL53L1X1</a>- New dedicated demo for the power liftgate application</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>• Automatic liftgate demo</li> </ul> <p>Updates:</p> <ul style="list-style-type: none"> <li>– New solution with the <a href="#">AEK-MOT-TK200G1</a> to drive the linear motor actuators, the <a href="#">X-NUCLEO-NFC06A1</a> to emulate the keyless scenario, and the <a href="#">AEK-COM-BLEV1</a> to open/close the trunk with an Android app running on a mobile phone. The demo has been developed with a model-based design using MATLAB®. The model is included in the project folder under the directory "MATLAB®".</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <a href="#">SPC58EC80E5</a> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <a href="#">SPC584B70E5</a> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <a href="#">SPC582B</a> Chorus line, single core 80 MHz, 1 Mb flash memory</li> </ul> <p>New component released:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-MOT-3P99081</a> The <a href="#">AEK-MOT-3P99081</a> evaluation board is based on the SPC560P Pictus 32-bit MCU and the <a href="#">L9908</a> gate driver allowing the control of 6 N-channel FETs for brushless motors in automotive applications. The <a href="#">AEK-MOT-3P99081</a> supports independent encoder inputs and Hall sensors to detect and control the motor speed.</li> <li>• <a href="#">AEK-MOT-TK200G1</a> The board hosts a <a href="#">L99DZ200G</a>, a door zone system IC providing electronic control modules with enhanced power management functionality. The two low-drop voltage regulators of the device supply the system microcontroller and the external peripheral loads. They also provide enhanced system standby functionality with a programmable local and remote wake-up capability. In addition, the <a href="#">L99DZ200G</a> device features five high-side drivers to supply the LEDs, and two high-side drivers to supply the bulbs, thus noticeably increasing the system-level integration.</li> <li>• <a href="#">X-NUCLEO-NFC06A1</a> The <a href="#">X-NUCLEO-NFC06A1</a> NFC card reader expansion board is based on the <a href="#">ST25R3916</a> device. The expansion board is configured to support ISO14443A/B, ISO15693, FeliCa™, and AP2P communication. The <a href="#">ST25R3916</a> manages frame coding and decoding in reader mode for standard applications, such as NFC, proximity, and vicinity HF RFID standards. It supports ISO/IEC 14443 Type A and B, ISO/IEC 15693 (single subcarrier only) and ISO/IEC 18092 communication protocols as well as the detection, reading, and writing of NFC Forum Type 1, 2, 3, four, and five tags. This board is the new version of the <a href="#">X-NUCLEO-NFC05A1</a>.</li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>• None</li> </ul>
Bugfix release (version 1.5.1)	<p>Components updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-MOT-2DCxxx</a> - Bugfix in the Demo</li> <li>• <a href="#">AEK-LED-21DISM1</a> - Bugfix in the Driver</li> <li>• <a href="#">AEK-MOT-SM81M1</a> - Driver optimization</li> <li>• <a href="#">AEK-AUD-C1D9031</a> - Demo updated with the new I<sup>2</sup>C settings</li> <li>• <a href="#">AEK-SNS-VL53L1X1</a>- Demo updated with the new I<sup>2</sup>C settings</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>• Automatic liftgate demo - Bug fixed</li> </ul>

Type	Summary
	<p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <a href="#">SPC58EC80E5</a> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <a href="#">SPC584B70E5</a> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <a href="#">SPC582B</a> Chorus line, single core 80 MHz, 1 Mb flash memory</li> </ul> <p>New component released:</p> <ul style="list-style-type: none"> <li>• None</li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>• None</li> </ul>
Minor release (version 1.5.0)	<p>Components updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-MOT-2DC40Y1</a> and <a href="#">AEK-MOT-2DC70S1</a> - fixed bug in driver</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>• None</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <a href="#">SPC58EC80E5</a> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <a href="#">SPC584B70E5</a> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <a href="#">SPC582B</a> Chorus line, single core 80 MHz, 1 Mb flash memory</li> </ul> <p>New component released:</p> <ul style="list-style-type: none"> <li>• <b>AEK-LCD-ILI9341</b> This component is designed for commercially available touch LCD displays (240x320 pixels with up to 65 K colors per pixel) based on the ILI9341 controller, managing up to two LCDs in parallel. The touch circuit is managed by the XPT2046 controller. Communication is based on the SPI protocol.</li> <li>• <b>AEK-COM-NFC05A1</b> <ul style="list-style-type: none"> <li>– New Demo for SPC58EC Chorus 4M</li> </ul> </li> <li>• <b>SPC5-MCTK-01</b> <ul style="list-style-type: none"> <li>– New Demo for SPC58ECxx (Chorus 4M) The demo implements a CAN bus communication between an SPC58EC Chorus MCU and an SPC5-MCTK-01 automotive three-phase motor control kit based on the SPC560P Pictus MCU and L9907 predriver. Through CAN messages, it is possible to perform basic operations on the motor, such as ramp, acceleration, deceleration, and brake. In addition, it is possible to read and set registers related to the motor parameters. A serial terminal can be used to track and verify performed operations.</li> </ul> <p><i>Important:</i>     <i>Before testing this demo, update the firmware on the SPC5-MCTK-01 platform by downloading the demo for the SPC560P Pictus MCU from AutoDevKit to enable the CAN port.</i></p> </li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>• <b>Automatic liftgate demo</b> The automatic liftgate demo includes motor actuation for automatic car trunk opening. This innovative solution implements a specific foot gesture recognition with Time-of-Flight (ToF) sensors. The system has been proved reliable in different light, weather and soil conditions, and feet sizes.</li> </ul>
Minor release (version 1.4.0)	<p>Components updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-POW-100W4V1</a> - fixed bug in driver</li> <li>• <a href="#">AEK-LED-21DISM1</a> - fixed bug in driver</li> <li>• <a href="#">AEK-MOT-2DC40Y1</a> and <a href="#">AEK-MOT-2DC70S1</a> - fixed bug in driver</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>• None</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <a href="#">SPC58EC80E5</a> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <a href="#">SPC584B70E5</a> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <a href="#">SPC582B</a> Chorus line, single core 80 MHz, 1 Mbflash</li> </ul>

Type	Summary
	<p>New component released:</p> <ul style="list-style-type: none"> <li>• <b>AEK-AUD-C1D9031</b> The <a href="#">AEK-AUD-C1D9031</a> is a very compact AVAS solution based on <a href="#">SPC582B60E1</a> Chorus family MCU and <a href="#">FDA903D</a> Class D audio amplifiers that emit warning sounds to alert pedestrians of the presence of e-vehicles. The <a href="#">AEK-AUD-C1D9031</a> integrates two audio amplifiers in stereo mode or two separate audio channels. The board compact size allows the designer to strategically place different modules around the vehicle to ensure that warning sounds can be heard along the entire vehicle length. All the modules can be controlled by a central MCU via the CAN interface.</li> <li>• <b>AEK-COM-NFC05A1</b> The <a href="#">AEK-COM-NFC05A1</a> implements the driver for <a href="#">X-NUCLEO-NFC05A1</a>. This board is configured to support ISO14443A/B, ISO15693, FeliCa™, and AP2P communication. The key embedded <a href="#">ST25R3911B</a> IC manages frame coding and decoding in reader mode for standard applications, such as NFC, proximity, and vicinity HF RFID standards.</li> <li>• <b>AEK-SNS-VL53L1X1</b> The <a href="#">AEK-SNS-VL53L1X1</a> implements the driver for <a href="#">VL53L1X-SATEL</a>. The on-board Time-of-Flight (ToF) laser-ranging sensor, belonging to the ST FlightSense product family, is the fastest miniature ToF sensor on the market with accurate ranging up to 4 m and fast ranging frequency up to 50 Hz.</li> <li>• <b>AEK-CON-SENSOR1</b> <a href="#">AEK-CON-SENSOR1</a> connector board for automotive MEMS sensors supports the DIL24 socket boards. The related software components can be used to manage the following MEMS families through the high-level APIs: <ul style="list-style-type: none"> <li>– <a href="#">AIS2DW12</a> - ultra-low-power 3-axis accelerometer for automotive applications</li> <li>– <a href="#">ASM330LHH</a> - automotive 6-axis inertial module: 3-axis accelerometer and 3-axis gyroscope</li> <li>– <a href="#">IIS2ICLX</a> - high accuracy, high resolution, low power, 2-axis digital inclinometer with embedded machine learning core</li> <li>– <a href="#">IIS3DWB</a> - ultra-wide bandwidth, low-noise, 3-axis digital vibration sensor</li> </ul> </li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>• None</li> </ul>
<p>Minor release (version 1.3.0)</p>	<p>Components updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-POW-L5964V1</a> - fixed bug in driver</li> <li>• <a href="#">AEK-LED-21DISM1</a> - fixed bug in driver</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-AUD-D903V1</a> - Bugfix in the Demo example code</li> <li>• <a href="#">AEK-POW-L5964V1</a> - Bugfix in the Demo example code</li> <li>• Adaptive front-lighting Demo - Bug fixed</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <a href="#">SPC58EC80E5</a> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <a href="#">SPC584B70E5</a> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <a href="#">SPC582B</a> Chorus line, single core 80 MHz, 1 Mbflash</li> </ul>

Type	Summary
	<p>New component released:</p> <ul style="list-style-type: none"> <li> <b>AEK-POW-100W4V1</b>            The <b>AEK-POW-100W4V1</b> expansion board is designed for power car or truck body applications requiring different voltages, such as USB-PD or infotainment. The two buck converters available from the L5964 device are combined to achieve up to 5A of current with 20 V to reach 100 W power in a single and compact device. The output channel can deliver a fixed or variable output voltage via MCU control.         </li> <li> <b>AEK-MOT-2DCxxx</b>            The <b>AEK-MOT-2DC70S1</b> and <b>AEK-MOT-2DC40Y1</b> are very compact solutions for multi-DC motor-driving applications embedding all the driver and signal-decoding functions on the same board. Together with current sensing capability, the AEK-MOT-2DCxxx boards have three independent encoder inputs. The DC motor drivers have separated half-bridging driving thus allowing up to three separated motors with only two devices. Clearly, proper driving sequences have to be generated to avoid undesired activation of specific motors. For each motor 15 A can be provided with <b>AEK-MOT-2DC70S1</b> while 35 A can be provided with <b>AEK-MOT-2DC40Y1</b>. On the boards, two additional high side drivers are available featuring 85 A and 25 A output currents.         </li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>None</li> </ul>
Minor release (version 1.2.0)	<p>Components updated:</p> <ul style="list-style-type: none"> <li>All components have been updated to comply with <b>SPC5-STUDIO 6.0.0</b></li> <li><b>AEK-AUD-D903V1</b> – added monitoring of I<sup>2</sup>S test signal for real-time current monitoring</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>Demo for AVAS with sound generated by a mathematical function</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li><b>SPC58EC80E5</b> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li><b>SPC584B70E5</b> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li><b>SPC582B</b> Chorus line, single core 80 MHz, 1 Mbflash</li> </ul> <p>New component released:</p> <ul style="list-style-type: none"> <li>None</li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>None</li> </ul>
Bug fix release (version 1.1.1)	<p>Components updated:</p> <ul style="list-style-type: none"> <li><b>EV-VNx7x</b> (added methods for current sensing and output current; ADC can now be user-defined at 3.3 V or 5 V)</li> <li><b>EV-VNHx7xx</b> (added methods for current sensing and output current; ADC can now be user-defined at 3.3 V or 5 V)</li> <li><b>AEK-POW-L5964V1</b> (removed warnings, driver optimization, changed picture)</li> <li>Linear Hall-effect sensor (ADC can now be user-defined at 3.3 V or 5 V)</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>Adaptive Front Lighting (AFL) Demo - updated EV-VNx7xxx component</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li><b>SPC58EC80E5</b> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li><b>SPC584B70E5</b> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li><b>SPC582B</b> Chorus line, single core 80 MHz, 1 Mbflash</li> </ul> <p>New component released:</p> <ul style="list-style-type: none"> <li>None</li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>None</li> </ul>

Type	Summary
<p>Minor release (version 1.1.0)</p>	<p>Components updated:</p> <ul style="list-style-type: none"> <li>• <a href="#">AEK-LED-21DISM1</a> (removed warnings and driver optimization)</li> <li>• <a href="#">AEK-MOT-SM81M1</a> (removed warnings and driver optimization)</li> <li>• EV-VNx7x (removed warnings and driver optimization)</li> <li>• EV-VNHx7xx (removed warnings and driver optimization)</li> <li>• <a href="#">AEK-POW-L5964V1</a> (removed warnings, driver optimization, changed picture)</li> <li>• AEK-SNS-LIDA1M8 (removed warnings and driver optimization)</li> <li>• Linear Hall-effect sensor (removed warnings and driver optimization)</li> </ul> <p>Demos updated:</p> <ul style="list-style-type: none"> <li>• Adaptive Front Lighting (AFL) Demo - code optimized</li> </ul> <p>Microcontroller supported:</p> <ul style="list-style-type: none"> <li>• <a href="#">SPC58EC80E5</a> Chorus line, dual core 180 MHz, 4 Mb flash memory, HSM</li> <li>• <a href="#">SPC584B70E5</a> Chorus line, single core 120 MHz, 2 Mb flash memory, HSM</li> <li>• <a href="#">SPC582B</a> Chorus line, single core 80 MHz, 1 mbflash</li> </ul> <p>New component released:</p> <ul style="list-style-type: none"> <li>• <b>AEK-COM-BLEV1</b> The <a href="#">AEK-COM-BLEV1</a> evaluation platform is based on the <a href="#">BlueNRG-1</a>, low-power Bluetooth® smart system on chip, compliant with the Bluetooth® specification and supporting master, slave and simultaneous master-and-slave roles.</li> <li>• <b>AEK-COM-GNSST31</b> The <a href="#">AEK-COM-GNSST31</a> represents an affordable, easy to use, global navigation satellite system (GNSS) module, embedding a <a href="#">Teseo-LIV3F</a> single die standalone positioning receiver IC, usable in different configurations in your SPC5-STUDIO project.</li> <li>• <a href="#">AEK-AUD-D903V1</a> It is a flexible class D audio amp with I<sup>2</sup>S interface for sound and I<sup>2</sup>C interface for programming. It features superb protection and status reporting.</li> </ul> <p>New demo released:</p> <ul style="list-style-type: none"> <li>• Demo for <a href="#">AEK-COM-GNSST31</a></li> <li>• Demo for <a href="#">AEK-COM-BLEV1</a></li> <li>• Demo for <a href="#">AEKD-BLINDSPOTx1</a></li> <li>• Demo for AVAS mono</li> <li>• Demo for AVAS stereo</li> <li>• Demo for AVAS engine sound simulator</li> </ul>

## Revision history

**Table 3. Document revision history**

Date	Version	Changes
13-Sep-2019	1	Initial release.
08-Nov-2019	2	Added details regarding STSW-AUTODEVKIT minor release version 1.0.1.
19-Feb-2020	3	Added details regarding STSW-AUTODEVKIT version 1.1.0.
30-Mar-2020	4	Added details regarding STSW-AUTODEVKIT version 1.1.1.
22-Jun-2020	5	Added details regarding STSW-AUTODEVKIT version 1.2.0.
08-Oct-2020	6	Added details regarding STSW-AUTODEVKIT version 1.3.0.
09-Feb-2021	7	Added details regarding STSW-AUTODEVKIT minor release version 1.4.0.
15-Mar-2021	8	Added details regarding STSW-AUTODEVKIT minor release version 1.5.0.
25-May-2021	9	Added details regarding STSW-AUTODEVKIT bugfix release version 1.5.1.
06-Dec-2021	10	Added details regarding STSW-AUTODEVKIT minor release version 1.6.0.
14-Mar-2022	11	Added details regarding STSW-AUTODEVKIT minor release version 1.7.0.
04-Nov-2022	12	Added AutoDevKit Studio 2.0.0 replacing AutoDevKit library.
03-Apr-2023	13	Added AutoDevKit Studio minor release 2.1.0.
10-Nov-2023	14	Added AutoDevKit Studio minor release 2.2.0. Updated <i>Section 2.3 Supported connector boards</i> and <i>Section 3 Previous versions</i> .
22-Nov-2023	15	Added AutoDevKit Studio minor release 2.2.1.
11-Jun-2024	16	Added AutoDevKit Studio minor release 2.4.0. Updated <i>Section Introduction</i> , <i>Table 1. STSW-AUTODEVKIT release summary</i> , <i>Section 1.1: System requirements</i> and <i>Section 2.2: Supported microcontroller boards</i> .

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