ETAS

DRIVING EMBEDDED EXCELLENCE

# ETAS ETK-S22.0A Emulator Probe for RH850C1x and RH850E1x Family

## User Guide

www.etas.com

## Copyright



ETK-S22.0A - User Guide R10 EN - 11.2021

# Contents

# 1 About this Document

## 1.1 Classification of Safety Messages

The safety messages used here warn of dangers that can lead to personal injury or damage to property:

 **DANGER**

indicates a hazardous situation with a high risk of death or serious injury if not avoided

 **WARNING**

indicates a hazardous situation of medium risk which could result in death or serious injury if not avoided.

 **CAUTION**

indicates a hazardous situation of low risk which may result in minor or moder-ate injury if not avoided.

***NOTICE***

indicates a situation which may result in damage to property if not avoided.

## 1.2 Presentation of Instructions

The target to be achieved is defined in the heading. The necessary steps for this are in a step-by-step guide:

Target definition

1. Step 1
2. Step 2
3. Step 3

> Result

## 1.3 Typographical Conventions

### Software

| | |
|---|---|
| `OCI_CANTxMessage msg0 =` | Code snippets are presented on a gray background and in the Courier font.<br>Meaning and usage of each command are explained by means of comments. The comments are enclosed by the usual syntax for comments. |
| Choose **File → Open**. | Menu commands are shown in boldface. |
| Click **OK**. | Buttons are shown in boldface. |
| Press <ENTER>. | Keyboard commands are shown in angled brackets. |
| The "Open File" dialog box is displayed. | Names of program windows, dialog boxes, fields, etc. are shown in quotation marks. |
| Select the file `setup.exe`. | Text in drop-down lists on the screen, program code, as well as path- and file names are shown in the Courier font. |
| A *distribution* is always a one-dimensional table of sample points. | General emphasis and new terms are set in italics. |

### Hardware

| | |
|---|---|
| **Bold** | Menu commands, buttons, labels of the product |
| *Italic* | Emphasis on content and newly introduced terms |

## 1.4 Presentation of Supporting Information

**NOTE**

Contains additional supporting information.

# 2 Basic Safety Notices

This chapter contains information about the following topics:



## 2.1 General Safety Information

Please observe the Product Safety Notices ("ETAS Safety Notice") and the following safety notices to avoid health issues or damage to the device.

**NOTE**

Carefully read the documentation (Product Safety Advice and this User Guide) that belongs to the product prior to the startup.

ETAS GmbH does not assume any liability for damages resulting from improper handling, unintended use or non-observance of the safety precautions.

## 2.2 Requirements for Users and Duties for Operators

The product may be assembled, operated and maintained only if you have the necessary qualification and experience for this product. Improper use or use by a user without sufficient qualification can lead to damages or injuries to one's health or damages to property.
The safety of systems using the product is the responsibility of the system integrator.

### General Safety at Work

The existing regulations for safety at work and accident prevention must be followed. All applicable regulations and statutes regarding operation must be strictly followed when using this product.

## 2.3 Intended Use

An ETK is an electronic component that is installed in a vehicle control unit (ECU) to read data from the ECU or write data to the ECU.

## Application Area of the Product

This product was developed and approved for automotive applications. For use in other application areas, please contact your ETAS contact partner.

## Requirements for Operation

The following requirements are necessary for safe operation of the product:

- Use the product only according to the specifications in the corresponding User Guide. With any deviating operation, the product safety is no longer ensured.
- Observe the regulations applicable at the operating location concerning electrical safety as well as the laws and regulations concerning work safety!
- Do not apply any voltages to the connections of the product that do not correspond to the specifications of the respective connection.
- Connect only current circuits with safety extra-low voltage in accordance with EN 61140 (degree of protection III) to the connections of the product.
- The power supply for the product must be safely disconnected from the supply voltage. For example, use a car battery or a suitable lab power supply.
- Use only lab power supplies with double protection to the supply system.
- Ensure that the connections of the power supply are easily accessible.
- The module does not have an operating voltage switch.
  - Switch on the product by connecting the power supply cable with the power supply or by switching on the power supply.
  - Switch off the product by disconnecting it from the power supply or by switching off the power supply.

**DANGER**

**Connect the power cord only with a vehicle battery or with a lab power supply! A connection to power outlets is prohibited.**

Route the power cord in such a way that it is protected against abrasion, damages, deformation and kinking. Do not place any objects on the power cord.

Never apply force to insert a plug into a socket. Ensure that there is no contamination in and on the connection, that the plug fits the socket, and that you correctly aligned the plugs with the connection.

Do not use the product in a wet or damp environment.

Do not use the product in potentially explosive atmospheres.

Keep the surfaces of the product clean and dry.

## Potential Equalization

**CAUTION**

**Danger from inadvertent current flow!**

Depending on the design, the shield of the Ethernet cables can be connected with the housing of the module. Install the products only on components with the same electrical potential or isolate the products from the components.

## Requirements for the technical State of the Product

The product is designed in accordance with state-of-the-art technology and recognized safety rules. The product may be operated only in a technically flawless condition and according to the intended purpose and with regard to safety and dangers as stated in the respective product documentation. If the product is not used according to its intended purpose, the protection of the product may be impaired.

## Maintenance and Cleaning

The product is maintenance-free. Use a lightly moistened, soft, lint-free cloth for cleaning the product. Ensure that no moisture can enter. Never spray cleaning agents directly onto the product. Do not user any sprays, solvents or abrasive cleaners which could damage the product.

## Transport and Installation

**CAUTION**

**The ETK can be damaged or destroyed!**

Some components of the ETK board may be damaged or destroyed by electrostatic discharges. Please keep the ETK in its storage package until it is installed.

The board should only be taken from its package, configured, and installed at a work place that is protected against static discharge.

**CAUTION**

During installation and removal, ECU and ETK must be in a de-eenergized state!

**CAUTION**

**Risk of short circuiting the internal signals of the ETK!**

When you mount the ETK to the ECU, you must ensure that the screws and washers used will not penetrate the ETK printed circuit board.

**CAUTION**

**Differences in case ground potentials can cause high currents to flow through the shields of the cables that connect various system modules.**

Ensure that the module mounting surfaces are at the same electrical potential or insulate the modules from their mounting surfaces.

### Cabling

Use exclusively ETAS cables at the connections of the product! Adhere to the maximum permissible cable lengths! Observe the assignment of the cables to the connectors! Detailed information about cabling is located in the ETK User Guides.

## 2.4 Identifications on the Product


**Fig. 2-1** Adhesive Label (Example: Label for XETK-S14.0)

The following symbols are used for identifications of the product:

| Symbol | Description |
|---|---|
|  | The User Guide must be read prior to the startup of the product! |
|  | Symbol for WEEE, see chapter 2.5 on page 12 |
|  | Symbol for CE conformity, see chapter 2.6.1 on page 13 |
|  | UKCA conformity symbol (Great Britain), see chapter 2.6.2 on page 13) |
|  | Symbol for China RoHS, see chapter 2.7.2 on page 13 |
|  | Symbol for China RoHS, see chapter 2.7.2 on page 13 |

| Symbol | Description |
|---|---|
|  | Symbol for electrostatic sensitive components |
| XETK-S14.0A | Product designation (example) |
| F 00K 110 722 | Order number of the product (example) |
| SN: yyxxxxx | Serial number (7-digit) |
| XXXX/YY | Product version |
| ZZZZ | Year of manufacture |
| ETAS GmbH,<br>PO Box 300220,<br>70442 Stuttgart,<br>Germany | Manufacturer's address |

**NOTE**

For symbols and product information one or several adhesive labels can be used.

## 2.5 Taking the Product Back and Recycling

The European Union has passed a directive called Waste Electrical and Electronic Equipment, or WEEE for short, to ensure that systems are setup throughout the EU for the collection, treating and recycling of electronic waste.

This ensures that the devices are recycled in a resource-saving way representing no danger to health or the environment.

**Fig. 2-2** WEEE-Symbol

The WEEE symbol (see Fig. 2-2 on page 12) on the product or its packaging shows that the product must not be disposed of as residual garbage.

The user is obliged to collect the old devices separately and return them to the WEEE take-back system for recycling. The WEEE directive concerns all ETAS devices but not external cables or batteries.

For more information on the ETAS GmbH Recycling software, contact the ETAS sales and service locations.

## 2.6 Declaration of Conformity

### 2.6.1 CE Declaration of Conformity (European Union)

With the CE mark attached to the product or its packaging, ETAS confirms that the product corresponds to the applicable product-specific European Directives. The CE Declaration of Conformity for the product is available upon request.

### 2.6.2 UKCA Declaration of Conformity (Great Britain)

With the UKCA mark attached to the product or its packaging, ETAS confirms that the product corresponds to the product-specific, applicable standards and directives of Great Britain. The UKCA declaration of conformity for the product is available on request.

## 2.7 RoHS Conformity

### 2.7.1 European Union

The EU Directive 2011/65/EU limits the use of certain dangerous materials for electrical and electronic devices (RoHS conformity).

This product does not contain any of the restricted substances specified in the EU Directive 2011/65/EU or exceeds the maximum concentrations stipulated therein. For individual electronic components used in our products, there are currently no equivalent alternative substances, which is why we make use of the exception 7C-I in Annex III of this Directive.

ETAS confirms that the product corresponds to this directive which is applicable in the European Union.

### 2.7.2 China

ETAS confirms that the product meets the product-specific applicable guidelines of the China RoHS (Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation) applicable in China with the China RoHS marking affixed to the product or its packaging.

## 2.8 Declarable Substances (European Union)

Some products from ETAS GmbH (e.g. modules, boards, cables) use components with substances that are subject to declaration in accordance with the REACH regulation (EU) no.1907/2006.
Detailed information is located in the ETAS download center in the customer information "REACH Declaration" (www.etas.com/Reach). This information is continuously being updated.

## 2.9 Use of Open Source Software

The product uses Open Source Software (OSS). This software is installed in the product at the time of delivery and does not have to be installed or updated by the user. Reference shall be made to the use of the software in order to fulfill OSS licensing terms. Additional information is available in the document "OSS Attributions List" at the ETAS website (www.etas.com).

# 3 Introduction

This chapter contains information about the following topics:



## 3.1 Applications

The ETK-S22.0A is an emulator probe for the Emulator Probe for Renesas RH850\C1x and RH850\E1x Family. It is a typical serial ETK with a specific JTAG and an AUDR interface. This serial ETK can be used for measurement and calibration applications.

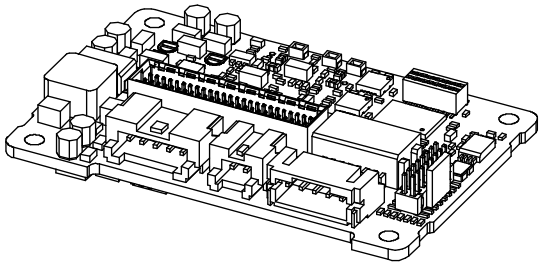

**Fig. 3-1** ETK-S22.0A

It is compatible with the ETAS calibration and development system interface (e.g. ES590, ES591, ES592, ES593-D, ES595, ES910).

## 3.2 Features

- Measurement interface
  - Serial ETK interface with 100 Mbit/s to the calibration and development system
- ECU interface
  - JTAG interface (RH850\E1x) clock speed configurable: 5 MHz, 10 MHz, 20 MHz, 25 MHz
  - AUDR interface (RH850\C1x and RH850\E1x) clock speed configurable: 10 MHz, 20 MHz

**NOTE**

The max. allowed JTAG and AUDR clock depends on the core frequency of the microcontroller. Max. clock speed is 1/4 of the core frequency.

  - 3.3 V ECU interface voltage level
  - 50 pin ERNI plus 5 pin JST

- Trigger interface
  - Pinless trigger via JTAG (32 total measurement rasters)
  - Pinless trigger via AUDR (RH850E1x: 16 total measurement rasters; RH850C1H: 32 triggers (16 from Core1 and 16 from Core2))
  - 4 triggers generated by internal timers
- Debugger interface (not supported for AUDR)
  - additional connector for external debug hardware
  - ETK hardware is prepared for debugger detection only. It does not support simultaneous debugging and measurement.
- Startup protocoll for ETK/ ECU synchronization via JTAG and AUDR pins
- Permanent storage of configuration in EEPROM
- Configuration of ETK via XCT Configuration Tool
- ETK firmware update (update of the ETK hardware definition code [HDC]) supports by service software HSP
- Mounting possibilities inside or on top of ECU
- Temperature range suitable for automotive applications

For more technical data on the ETK-S22.0A consult the chapter “Technical Data” on page 33.

# 4 Hardware Description

This chapter contains information about the following topics:



## 4.1 Architecture

Fig. 4-1 shows the block diagram of the ETK-S22.0A.

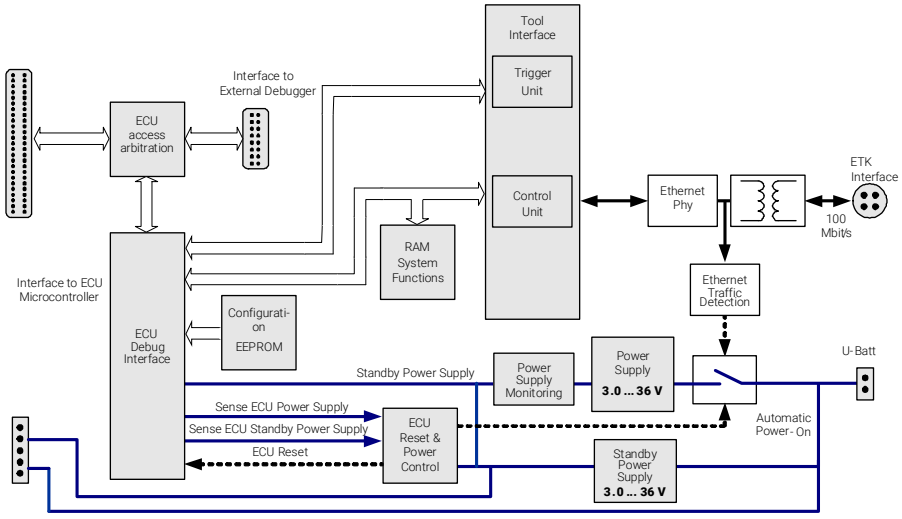


**Fig. 4-1** ETK-S22.0A Architecture

The microcontroller can communicate with the memories or peripheral components of the development ECU. The ETK-S22.0A is connected to the serial debug and test interface of the microcontroller (JTAG/ AUDR). It converts these interface to the 100 MBit/s serial ETK interface and extends in this way the length of the connection line.

While the microcontroller accesses the data out of the tuning memory, the content of the tuning memory can simultaneously be modified by the calibration and development system through the serial ETK interface. This process enables adjustments of parameters, characteristic lines and maps through the

calibration and development system. Using an additional measurement data memory area, the ECU microcontroller can send data to the calibration and development system which receives, buffers and processes this measured data (e.g. DISTAB13).

The 100 Mbit/s serial interface provides communication with the calibration and development system.

The power supply for the ETK-S22.0A is provided by a switch mode power supply, to minimize power dissipation.

## 4.2 ECU Interface

The ECU interface can be flexibly configured for several applications. For a HDC update, it is not necessary to unmount or disconnect the ETK-S22.0A from the ECU.

For currently supported microcontrollers refer to chapter 7.1.3 on page 34.

The ETK-S22.0A is connected via CON1 and CON2 to the ECU with two adapter cables (refer to Fig. 4-2 on page 19). The pin definition depends on the application and the microcontroller type. In general the ECU interface consists of

- 1 ECU voltage line, which is not used for ETK power supply but only for detection of the ECU status, therefore the power consumption on these line is negligible (refer to chapter 4.5 on page 21)
- 1 Reset line to control the system reset and monitor
- 7 Debug Interface lines for the communication between the ETK-S22.0A and the microcontroller
- 2 ground lines for a proper shielding of the ECU interface lines.

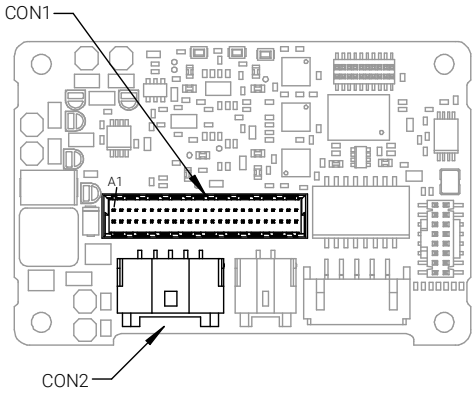


**Fig. 4-2** Location of the ECU Interfaces (ETK-S22.0A)

## 4.3 Serial ETK Interface

The interface utilizes a 100Base-TX transmission to achieve a transmission performance of 100 Mbit/s.

**NOTE**

To ensure stable communication only 100 Mbit cables delivered by ETAS shall be used.

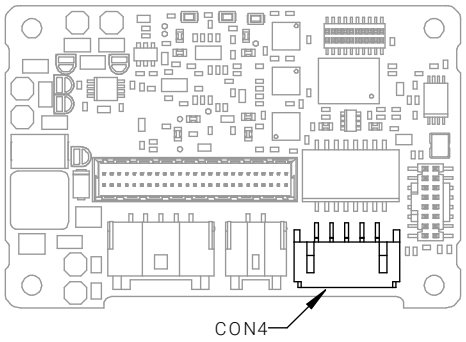


**Fig. 4-3** Location of the Serial ETK Interface (ETK-S22.0A)

## 4.4 Debug Interface

The ETK-S22.0A features a JTAG debugging interface connector CON5 (Samtec 16 pin). This connector can be used to attach debug tools (e.g. Lauterbach or E1 emulator, if available). We recommend to use ETAS Debug - Adapter (e.g. ETAF12) to connect the debugger to the ETK.

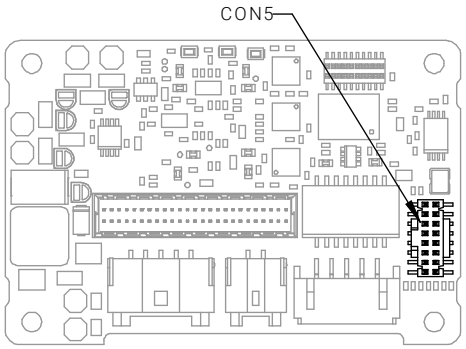


**Fig. 4-4** Location of the Debugger Interface (ETK-S22.0A)

By using the debug interface at the ECU board for serial ETK connection, it is not available for debugging tools anymore. Arbitration mechanisms are required to simultaneously work e.g. with measurement and calibration tools as well as with debugging tools. The ETK-S22.0A does not support a hardware

arbitration unit for the JTAG interface. So ETK-S22.0A does not support the parallel of use both debugger for debugging and ETAS tools for measurement and calibration.

**NOTE**

Debug interface is not support for AUDR interface.

## 4.5 Power Supply

The ETK-S22.0A needs a permanent power supply. It is powered directly from the car battery. The input voltage may vary between 5 V and 36 V (3 V drops for 3 seconds). In case of higher input voltages to the ETK an additional voltage converter is required.

All necessary voltages are created through switching power supplies which minimizes power dissipation. The power supply of the ECU is not affected by the ETK-S22.0A. An automatic switch ensures that the power supply of the ETK-S22.0A is automatically switched on and off when the ETK enters and leaves its sleep mode.

The ETK-S22.0A can be supplied with power through five pins connector CON7. The 2 pin JST connector CON3 can be used additionally to connect a power supply $U_{Batt2}$. The power supply on CON3 must use the GND of CON2 (refer to chapter 5.2.2).

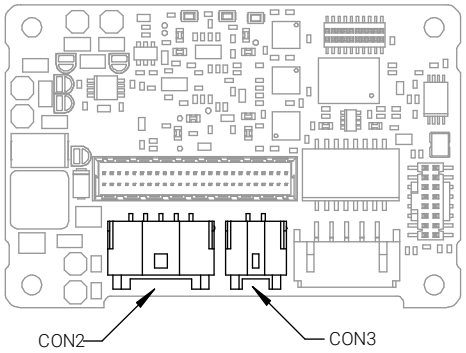


**Fig. 4-5** Location of the Power Supply Connectors (ETK-S22.0A)

## 4.6 ECU Voltage Supervisor

The ECU voltage (VDDP) is monitored by the ETK to recognize whether the ECU is switched on or off. The ETK-S22.0A does not supply the standby voltage to tuning RAM and monitor this voltage.

**NOTE**

The ETK-S22.0A allows switching between reference page and working page only, if there is a valid voltage at the sense pin detected.

## 4.7 Status LEDs

There are three LEDs displaying the operating status of the ETK-S22.0A (Fig. 4-6 on page 22).

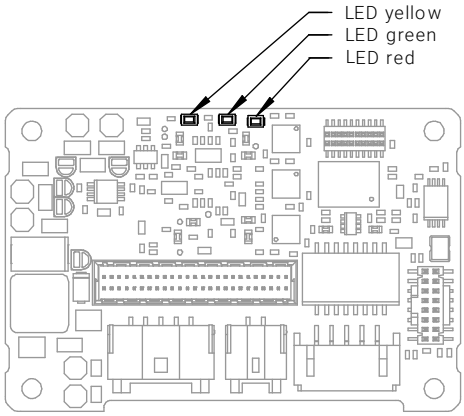


**Fig. 4-6** Status LEDs

| LED | State | Definition |
|---|---|---|
| Red | On | ETK-S22.0A is supplied with power and active (i.e. the ECU is switched on or the ETAS calibration and development system is connected and ready to communicate with the ETK-S22.0A) |
| Green | Off | Working Page contains data and is accessible from INCA |
| | Flashing | ETK-S22.0A is in boot configuration mode:<br>- measurement and calibration are not possible,<br>- after first initialization with INCA flashing stops |
| | On | Power supply has dropped under selected threshold:<br>- data retention of the calibration data manager in the ECU is no longer ensured<br>- as soon as the ETK-S22.0A switches on again, the ECU switches to the Reference Page.<br>Green LED stays lit until the calibration and development system downloads data into the calibration data memory. Otherwise switching to the Working Page is not possible. |
| Yellow | Off | ETK-S22.0A: no link to calibration system established |
| | On | 100 Mbit/s communication to calibration system established |

## 4.8 Data Emulation and Data Measurement

In the case of a serial ETK the measurement RAM is part of the ECU and is not accessible until the ECU is powered up and the basic initialization has been performed. The goal must be to perform the download into the ECU after the ETK's startup message was sent.

All serial ETKs have a system of Reference and Working Page (ETAS two pages ETK concept). The Reference Page is located in the ECU flash and can not be modified by a simple write access. As with all serial ETK's this change must be done via Flash programming.

The Working Page is implemented with internal RAM overlaying the flash by using microcontroller internal mechanisms. The tuning RAM (overlay RAM) used for the emulation of calibration data must not be used by the ECU software directly. The ETK/INCA has the complete control over this RAM and it's contents. When enabling a data emulation or after power loss INCA establishes a basic start-up configuration of the data in the RAM by copying the corresponding data in the Flash to the emulation space.

In contrast to a parallel ETK no flash memory for permanent storage of the adjusted parameters (program data) is available on the ETK.

The switching between Reference and Working Page is performed by switching the data emulation on and off. It is done by modifying overlay registers of the microcontroller, which are dedicated only to the ETK. The microcontroller must change the values of these registers after the startup handshake with the ETK has been performe and after the INCA request.

The page switching is performed via a communication method with the ECU software. A small software protocol between the ECU and the host is needed to get the current page status and perform the switching. The access to the micro controller registers and the real page switching is completely under the control of the ECU software.

Another important restriction is that no access to memory is possible, while the ECU is not running. To enable a cold start measurement in spite of this restriction, a special procedure was defined to give the user the feeling of a parallel ETK.

## 4.9 ECU Interfaces

### 4.9.1 JTAG Interface

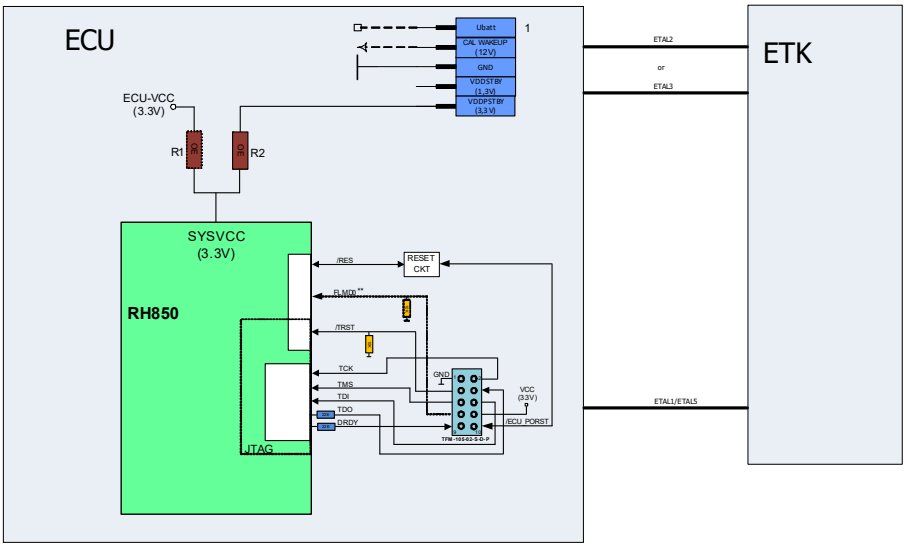


**Fig. 4-7** Equivalent Circuitry of the ECU JTAG Interface (ECU)

The ETK-S22.0A with RH850\E1x microntroller supports the JTAG mode for debugger arbitration, test and calibration. The JTAG mode can be configured in the ECU.

### 4.9.2 AUDR Interface

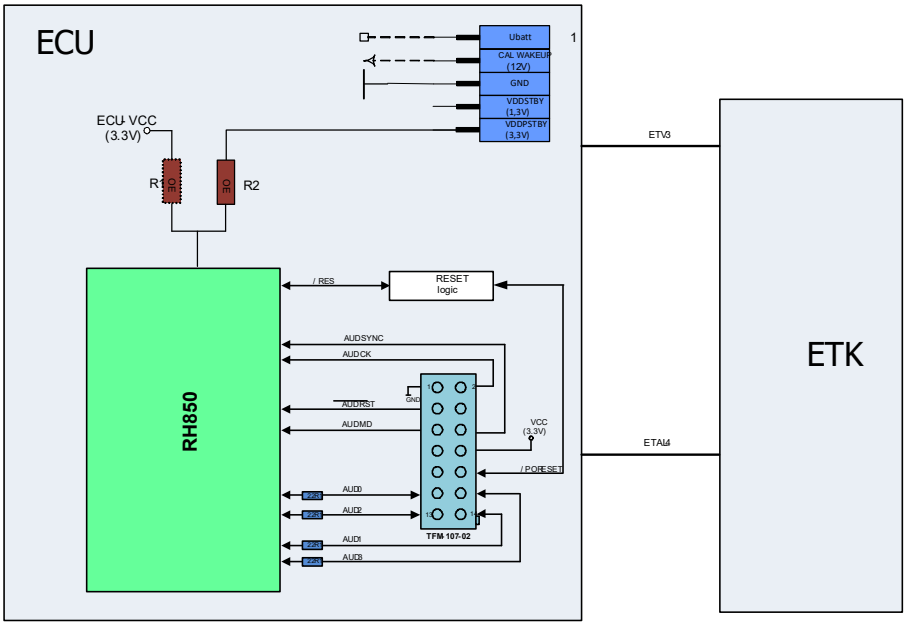


**Fig. 4-8** Equivalent Circuitry of the ECU AUDR Interface (ECU)

The ETK-S22.0A with RH850\C1x and RH850\E1x microntroller supports the AUDR mode for test and calibration. The AUDR mode can be configured in the ECU.

## 4.10 Trigger Modes: Overview

The ETK-S22.0A supports the following trigger modes:

- Pinless triggering
- Timer triggering

The trigger mode "Pinless Triggering" uses an internal Development Trigger Semaphore (DTS) for register triggerring (see also chapter “Pinless Triggering” on page 25).

The trigger mode "Timer Triggering" uses four internal timers of the ETK for triggering (see also chapter “Timer Triggering” on page 26).

## 4.11 Pinless Triggering

### 4.11.1 Startup Handshake

The trigger register based feature is used for the ETK startup handshake. The ECU must ensure that all memory ECC initializations have been completed prior to the start-up handshake.

For JTAG interface, Debug Trigger Register (DBG_TRG) of the micro-controller is used for the Startup Handshake purpose. ETK checks for valid hand-shake pattern (0x55555555) on this register of microcontroller.

For AUDR interface, AUDR Message Board Register(AUD_MBR) of the micro-controller is used for the Startup Handshake purpose. ETK checks for valid hand-shake pattern (0x5555) on this register of microcontroller.

### 4.11.2 ETK Trigger Generation (JTAG)

For generating triggers, the ECU software write index in the trigger register "DBG_TRG" by writing the index of the trigger in the trigger setting register "DBG_TRG".

**NOTE**

The selective setting of trigger bits is accomplished in hardware by the micro-controller and requires no Read-Modify-Write sequence by the ECU software.

The first 32 indexes of the trigger setting register "DBG_TRG" corresponds to an index in the same position in the trigger register "DBG_TRG", each of them corresponding to an ETK hardware trigger.

**NOTE**

Only the index 0 to 31 corresponding to the first 32 triggers are supported by ETK-S22.0A.

The ETK periodically polls the trigger register "DBG_TRG". The ETK sends a corresponding trigger message e.g. to the ES59x which starts acquisition of appropriate measurement data. The polling rate is determined by the fastest measurement raster and is configurable in a 10 µs to 50 ms range with a 50 µs default.

Active bits in trigger register "DBG_TRG" are automatically cleared by CPU when register is read by ETK.

### 4.11.3 ETK Trigger Generation (AUDR)

For generating triggers, the ECU software write index in the trigger register "AUD_MBR" by writing the index of the trigger in the trigger setting register "AUD_MBR".

For AUDR interface the first 16 for single core controller, 32 indexes for dual core controller of the trigger setting register "AUD_MBR" corresponds to an index in the same position in the trigger register "AUD_MBR", each of them corresponding to an ETK hardware trigger.

The ETK periodically polls the trigger register "AUD_MBR". The ETK sends a corresponding trigger message e.g. to the ES59x which starts acquisition of appro-priate measurement data. The polling rate is determined by the fastest measurement raster and is configurable in a 10 µs to 50 ms range with a 50 µs default.

Active bits in trigger register "AUD_MBR" are automatically cleared by the CPU when register is read by the ETK.

## 4.12 Timer Triggering

The trigger mode "Timer Triggering" uses four internal timers of the ETK for triggering. The trigger period of these timers is configurable in steps of 102 µs by the user.

If trigger mode "Timer Triggering" is used handshake will be not executed. The handshake is operated by an timeout defined in the A2L file.

The time intervals between trigger events are in accordance with the configured timer values. The period of the time trigger has to be defined in the A2L file. The maximum period duration is 400 ms.

The timers works in an asynchronous manner to the ECU.

If variables are measured from ECC protected memories the ECU software must ensure the proper initialization of these locations. A time-out period can be set in the ETK configuration to allow for the ECU to initialize the memories before the measurement begins.

Timer trigger and pin-less triggers are not supported simultaneously. If Timer trigger is enabled then Trigger polling for pin-less trigger is disabled.

## 4.13 Reset

The requirement for ETK reset mechanism is to ensure that power-up and power-down behavior of ECU is clean and smooth. The ETK-S22.0A normally drives /PORST low during ECU power up or upon INCA request.
The signal /PORST of the microcontroller is used by the ETK-S22.0A to detect when the ECU is in reset.

The ETK-S22.0A senses the switched ECU power supply. This allows it to detect when the ECU is off and forward this information to INCA. In addition, it allows the ETK to enter the power save mode with the calibration system (ES590/ES591) unplugged.

# 5 Installation

This chapter contains information about the following topics:



**CAUTION**

Some components of the interface board may be damaged or destroyed by electrostatic discharges. Please keep the board in its storage package until it is installed.

The board should only be taken from its package, configured, and installed at a work place that is protected against static discharge.

## 5.1 Connection to the ECU

**CAUTION**

**Risk of short circuiting the internal signals of the ETK!**

When you mount the ETK to the ECU, you must ensure that the screws and washers used will not penetrate the ETK printed circuit board.

For connecting the ETK-S22.0A to the ECU the ETK two adapters are recommended:

- at CON1 adapter ETAL1/ ETAL5 (JTAG mode) or ETAL4 (AUDR mode) and
- at CON2 adapter ETV3.

**NOTE**

The ETAL1 adapter and the ETV3 adapter need to be ordered seperately (refer chapter “Ordering Information” on page 55).

The suitable connector SAMTEC bit "TMF-105" should have been populated onto the ECU PCB for adapter ETAL1/ ETAL5.

The suitable connector SAMTEC bit "TMF-107" should have been populated onto the ECU PCB for adapter ETAL4.

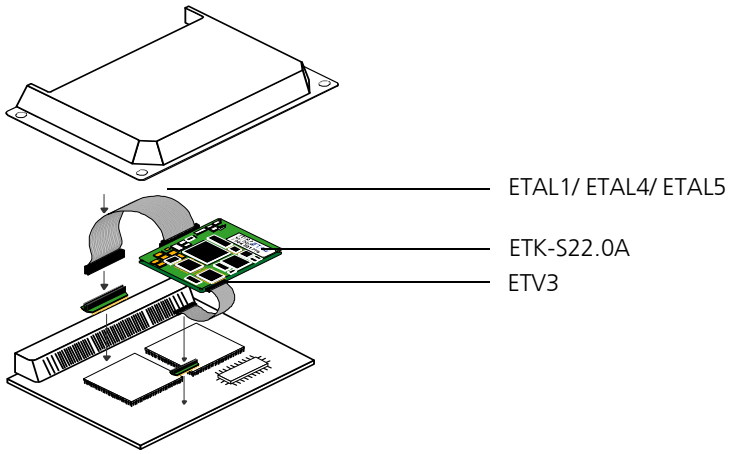


**Fig. 5-1** ETK-S22.0A Connection to the ECU

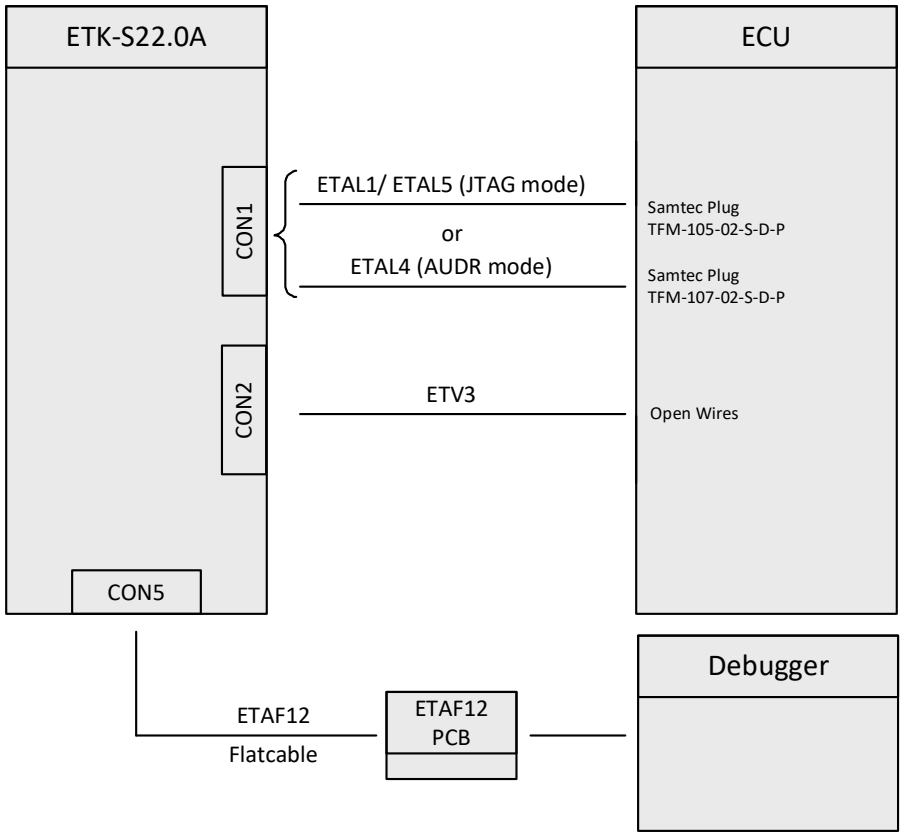


**Fig. 5-2** ETK-S22.0A Connection to the ECU and to the Debugger

**NOTE**

The debugger adapter ETAF12 (ETAF12 PCB with ETAF12 flat cable) is only available on request.

## 5.2 Connecting to the Power Supply

The ETK-S22.0A needs a permanent power supply (refer chapter “Power Supply” on page 21). There are different versions to ensure it.

### 5.2.1 Permanent Power Supply inside ECU available

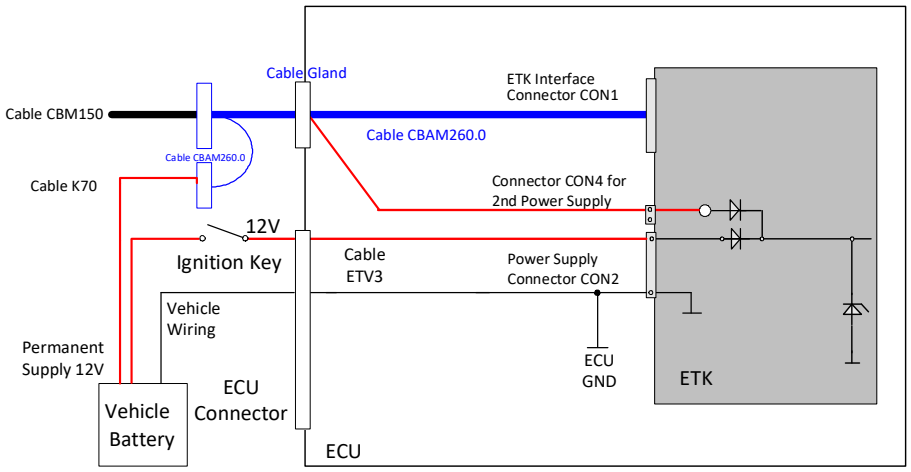


**Fig. 5-3** Permanent Power Supply inside ECU available

### 5.2.2 Permanent Power Supply inside ECU not available

#### 5.2.2.1 Wiring with KA50 Cable

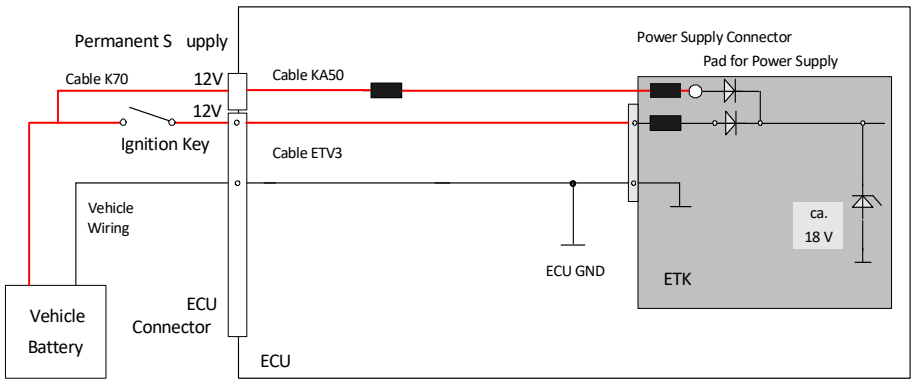


**Fig. 5-4** Permanent Power Supply inside ECU not available

# 6 ETK Configuration

The "ETK Configuration" chapter describes the ETK-S22.0A hardware configuration.

## 6.1 Overview

As already mentioned in previous chapters, some project-specific adjustments are necessary. Configuration data is stored permanently in a serial Flash.

Generating a valid configuration data set is supported by the "(X)ETK Configuration Tool" (XCT). The "(X)ETK Configuration Tool" contains information on all available XETKs and ETKs like ETK-S20, ETK-S21 and ETK-S22. The user is supported through a graphical interface.

The configuration is done in two steps:

A Generation of the special address offset for the emulation and measurement data memory.

The location of data areas, measured data output areas, trigger segment addresses etc. are familiar to the ECU software developer, or can be generated automatically. If an ECU description database (ASAP, ...) with the corresponding input exists, these inputs can be downloaded from this database. If necessary, a plausibility check is performed.

B Connection of the ETK to the ECU.

The ECU hardware developer defines the connection of the ETK to the ECU. The corresponding signals usually have to be adjusted for each microcontroller. All inputs are checked for plausibility, to make sure that a valid configuration is generated.

The "(X)ETK Configuration Tool" can create the following output:

A Direct ETK configuration

B Storage of the configuration in a data file

C The corresponding ASAP2 input

The most important outputs are the entries for the ASAP2 file. All A2L definitions necessary for configuring an ETK will be created. These are:

- Overlay Region definitions
- Memory Segment definitions
- ETK configuration features
- Raster definitions

If this parameters are entered correctly in the corresponding ECU description file, it guarantees that every time the calibration system is started, the ETK is checked for the appropriate configuration. If necessary, the ETK will be configured appropriately to the corresponding project.

## 6.2 Configuration Parameter

The "(X)ETK Configuration Tool" provides support concerning hardware configuration parameters and their possible values.

They are described for the different ETK types in the help document of the "(X)ETK Configuration Tool".

Starting the "(X)ETK Configuration Tool" help

1. Start the "(X)ETK Configuration Tool".

   The main window of the XCT tool opens.
2. Select in the menu bar **?** → **Contents**.

   The "(X)ETK Configuration Tool" help window opens.
3. Choose **Reference to User Interface** → (**X)ETK Hardware Configuration Parameters**.
4. Choose the topic **ETK-S22.0A**.

   The topic **ETK-S22.0A** contains information about the ETK-S22.0A hardware configuration parameters and their possible values.

# 7 Technical Data

This chapter contains information about the following topics:



## 7.1 System Requirements

### 7.1.1 ETAS Compatible Hardware

Compact Hardware: ES590, ES591, ES592, ES593-D, ES595, ES910 (ES690 is not supported)

### 7.1.2 PC with one Ethernet Interface

A PC with one open Ethernet interface (1 Gbit/s) with RJ45 connection is required. Ethernet interfaces that are implemented with an additional network card in the PC must feature a 32-bit data bus.

#### 7.1.2.1 Requirement to ensure successful Initialization of the Module

**NOTE**

It is imperative you disable the function which automatically switches to power-saving mode on your PC network adapter when there is no data traffic on the Ethernet interface!

**To deactivate the power saving mode**

Choose in Windows System Control Center / Device Manager / Network Adapter the used network adapter by double-click. Deactivate the "Allow the computer to turn off this device to save power" option in the "Power Management" register. Confirm your configuration.

The manufacturers of network adapter have different names for this function.

Example:

- "Link down Power saving"
- "Allow the computer to turn off this device to save power"

## 7.1.3 Software Support

### 7.1.3.1 JTAG Mode

You need following software versions to support the ETK-S22.0A:

| Microcontroller | HSP | INCA | ETK Tools | ASCET-RP | INTECRIO |
|---|---|---|---|---|---|
| RH850/ E1x-FCC1-1st cut (R7F701Z07) | V10.2.0 | V7.1.0 | V3.11.0 | V6.1.3 | V4.3 |
| RH850/ E1x-FCC1-2nd cut (R7F701Z05EDBG) | V10.4.0 | V7.1.4 | V4.0.0 | V6.1.3 | V4.3 |
| V850/FX4 (uPD704012) | V10.4.0 | V7.1.4 | V4.0.0 | V6.1.3 | V4.3 |
| RH850/ E1x-FCC2 (R7F701Z11EDBG) | V10.8.0 | V7.1.8 | V4.0.4 | V6.1.3 | V4.3 |

**NOTE**

Full EMU RAM support available in INCA V7.1.6 onwards for RH850/E1x-FCC1 2nd cut microcontroller.

### 7.1.3.2 AUDR Mode

You need following software versions to support the ETK-S22.0A:

| Microcontroller | HSP | INCA | ETK Tools | ASCET-RP | INTECRIO |
|---|---|---|---|---|---|
| RH850/ E1x-FCC1-2nd cut (R7F701Z05EDBG) | V10.6.0 | V7.1.6 | V4.0.2 | V6.1.3 | V4.3 |
| RH850/ C1H | V10.6.0 | V7.1.6 | V4.0.2 | V6.1.3 | V4.3 |
| RH850/ E1x-FCC2 (R7F701Z11EDBG) | V10.9.0 | V7.1.9 | V4.0.5 | V6.1.3 | V4.3 |

**NOTE**

Operating the ETK-S22.0A with older software versions is not possible.

## 7.2 ETK Firmware (HDC) Update

The ETK firmware update (update of the ETK hardware definition code [HDC]) is supported by the service software HSP instead of ETK Configuration Tool. Removal of ETK or ECU is not necessary. The service software HSP is running on the connected PC.

## 7.3 Data Emulation Memory and Microcontroller Support

The ETK-S22.0A uses the internal Tuning RAM of all in the table listed microcontrollers to emulate data in internal flash.

| Microcontroller | Max. RAM | Standby powered |
|---|---|---|
| RH850/ E1x-FCC1-1st cut (R7F701Z07) | 64 kbyte | Yes |
| RH850/ E1x-FCC1-2nd cut (R7F701Z05EDBG) | 768 kbyte | Yes |
| V850/FX4 (uPD704012) | 0 kbyte | N. A. |
| RH850/ C1H_SPH | 0 kbyte | N. A. (Single page calibration) |
| RH850/ E1x-FCC2 (R7F701Z11EDBG) | 1 Mbyte | Yes |

## 7.4 Measurement Data Memory

| Item | Characteristics |
|---|---|
| Location | Within the emulation memory when using DISTAB hooks |

## 7.5 Configuration

| Item | Characteristics |
|---|---|
| Configuration | Project-specific configuration for<br>- different microcontrollers or<br>- memory configurations<br>stored in EEPROM |
| Update | Logic devices updated through software |

## 7.6 Serial ETK Interface for Application System

| Item | Characteristics |
|---|---|
| Transmission speed | 100 Mbit/s |
| Cable length | max. 30 m / 100 ft |
| Serial Interface | DC decoupling |

## 7.7 Environmental Conditions

| Item | Characteristics |
|---|---|
| Temperature range (operation) | - 40 °C to +110 °C/ - 40 °F to +230 °F |
| Temperature range (storage) | 0 °C to +50 °C/ - 18 °F to +122 °F |
| Relative humidity (non-condensing) | 0 to 95% |
| Operating altitude | max. 5000 m/ 16400 ft |
| Contamination level | 2 |
| Degree of protection | Determined by installation in ECU |
| Overvoltage category (AC mains supply) | 2 |

## 7.8 Power Supply

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Permanent power supply (car battery) | $U_{Batt}$ | Vehicle usage [1)] | 4.3 [all values +/-0%] | 12 | 36 | V |
| Cranking voltage | $U_{Batt}$ | < 3 seconds | 3 | | | V |
| Standby current | $I_{STBY}$ | $U_{Batt}$ = 12 V; ECU off; no load from ECU; T = 20 °C | 10 | 28 | 35 | mA |
| Operating current | $I_{Batt}$ | $U_{Batt}$ = 12 V; no load from ECU; T = 20 °C | 50 | 100 | 220 | mA |
| Power dissipation | $P_{Batt}$ | $U_{Batt}$ = 12 V; no load from ECU; T = 20 °C | | 1.2 | | W |

[1)] The ETK-S22.0A implements reverse voltage protection in the same range and may be used only with central load dump protection.
24 V vehicles require $U_{Batt}$ disturbing pulse reduction to 12 V vehicle system.
12 V vehicles don't require special disturbing pulse reductions.

**NOTE**

The ETK-S22.0A will accept permanent power supply voltage dips (for additional details of 3 V low voltage operation, see ISO standard 16750).

## 7.9 Microcontroller Interface

| | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| ECU Power Supply Supervision Voltage 3,3V / 5V nominal | VDDP | ECU on | 2.46 | 2.56 | 2.66 | V |
| | VDDP | ECU off | 2.29 | 2.39 | 2.49 | V |
| | IDDP | Sense current at 5 V | | | 150 | µA |
| VDDPSTBY Output Voltage | VDDP-STBY | Max. 120 mA load | 3.14 | 3.3 | 3.46 | V |

## 7.10 Test Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Reset delay 1 [1)] | $t_{Reset1}$ | $U_{Batt}$ = 12 V<br>VDDP = 0 V ↑ 3.3 V/ 2.5 V<br>without transferring FPGA | 29 | | 40 | ms |
| Reset delay 2 [2)] | $t_{Reset2}$ | $U_{Batt}$ = 0 V ↑ 12 V<br>transfer FPGA | 360 | | 440 | ms |

[1)] Delay of ECU reset through ETK without transferring the FPGA ($U_{Batt}$ present, VDDP will be switched on)
[2)] max. delay of ECU reset through ETK ($U_{Batt}$ and VDDP will be switched on)

# 7.11 Timing Characteristics

## 7.11.1 JTAG Mode Timing Characteristics

The following diagrams show the timings the ETK-S22.0A in JTAG mode can process.

> **NOTE**
>
> JTAG timing parameters in this chapter refer to the JTAG interface (CON1/ CON6) of the ETK-S22.0A. The JTAG wiring to the ECU (ETAF1/ ETAL1 or ETAL5) must be taken account additionally.
> All timings are measured at a reference level of 1.5 V. Output signals are measured with 20 pF to ground and 50 Ω to 1.5 V.

### 7.11.1.1 JTAG Mode Timing Diagram

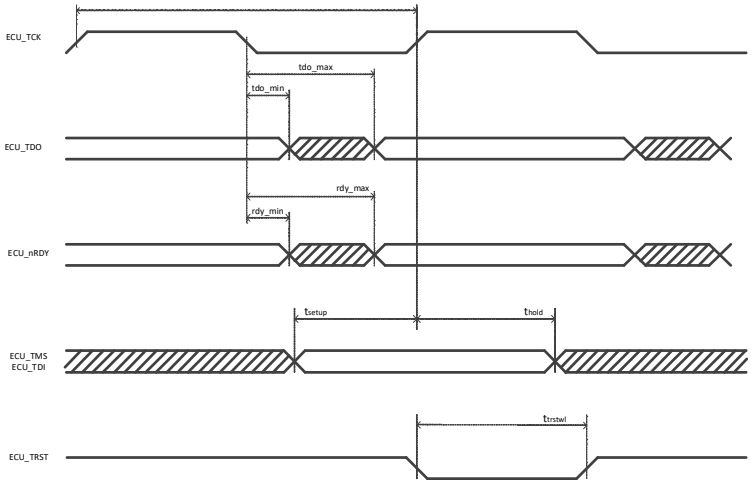


**Fig. 7-1** Timing Diagram (JTAG Mode)

### 7.11.1.2 JTAG Mode Timing Parameter

| Parameter | Symbol | Value [ns] | Comment |
|---|---|---|---|
| Nexus Clock Period (ETK --> Target) | $t_{tck}$ | 50 | 20 MHz Nexus JTAG Clock Frequency |
| | | 40 | 25 MHz Nexus JTAG Clock Frequency |
| TMS/TDI setup time (ETK --> Target) | $t_{setup}$ | 14 (min.) | Minimum 12 ns required for microcontroller |
| TMS/TDI hold time (ETK --> Target) | $t_{hold}$ | 14 (min.) | Minimum 12 ns required for microcontroller |
| TDO clock-to-out time (Target --> ETK) | $t_{do\_min}$ | 3 (min.) | Minimum 1 ns required by microcontroller specification |
| | $t_{do\_max}$ | $t_{tck}$-18 (max) | Minimum $t_{tck}$-20 ns required by microcontroller specification |
| TRST low level width | $t_{TRSTWL}$ | 100 (min.) | Minimum time required by microcontroller |

## 7.11.2 AUDR Mode Timing Characteristics

The following diagrams show the timings the ETK-S22.0A in AUDR mode can process.

> **NOTE**
>
> AUDR timing parameters in this chapter refer to the AUDR interface (CON1/ CON6) of the ETK-S22.0A. The AUDR wiring to the ECU (ETAF1/ ETAL4) must be taken account additionally.
> All timings are measured at a reference level of 1.5 V. Output signals are measured with 20 pF to ground and 50 Ω to 1.5 V.

### 7.11.2.1 AUDR Mode Timing Diagram

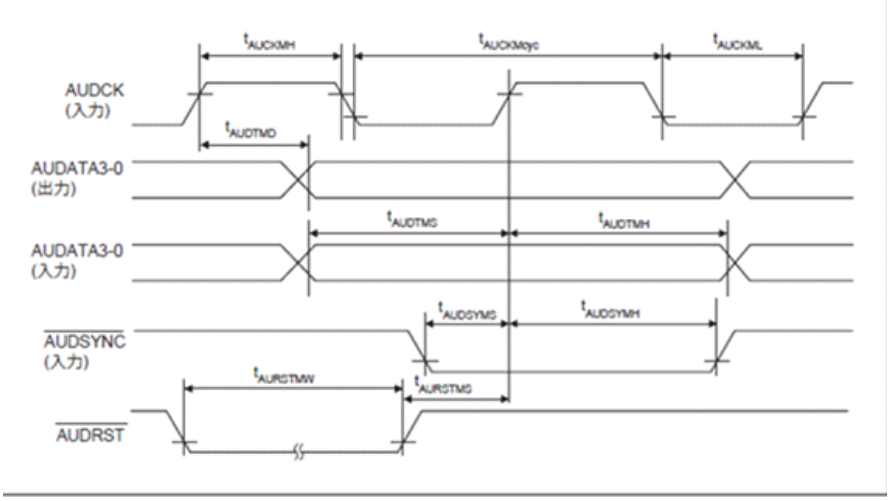


**Fig. 7-2** Timing Diagram (AUDR Mode)

### 7.11.2.2 AUDR Mode Timing Parameter

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| AUDCK cycle (monitor mode) | $t_{AUCKMcyc}$ | 2 | - | $t_{CYC}$ |
| AUDCK High level width (monitor mode) | $t_{AUCKMH}$ | 0.4 | - | $t_{AUCKMcyc}$ |
| AUDCK Low level width (monitor mode) | $t_{AUCKML}$ | 0.4 | - | $t_{AUCKMcyc}$ |
| /AUDRST setup time (monitor mode, AUDCK rising edge) | $t_{AURSTMS}$ | 30 | - | ns |
| /AUDRST input pulse width (monitor mode) | $t_{AURSTMW}$ | 5 | - | $t_{AUCKMcyc}$ |
| Monitor data output delay time (AUDCK rising edge) | $t_{AUDTMD}$ | - | 35 | ns |
| Monitor data input setup time (AUDCK rising edge) | $t_{AUDTMS}$ | 15 | - | ns |
| Monitor data input hold time (AUDCK rising edge) | $t_{AUDTMH}$ | 5 | - | ns |
| /AUDSYNC input setup time (AUDCK rising edge) | $t_{AUDSYS}$ | 15 | - | ns |
| /AUDSYNC input hold time (AUDCK rising edge) | $t_{AUDSYH}$ | 5 | - | ns |

## 7.12 Electrical Characteristics

### 7.12.1 Debugger Interface Connector CON5

| Signal | Pin Type | $V_{OL}$ (max) [V] | $V_{OH}$ (min) [V] | $V_{OH}$ (max) [V] | $V_{IL}$ (max) [V] | $V_{IH}$ (min) [V] | $V_{IH}$ (max) [V] | Leakage current [1] [µA] | Additional load by ETK [2] (typ) [pF] |
|---|---|---|---|---|---|---|---|---|---|
| VREF | XO [3] | - | 2.3 | 3.3 | - | - | - | - | - |
| TCK | I | 0.8 | 2.3 | 3.3 | - | - | - | +350 / +220 | 8 |
| TMS | I | 0.8 | 2.3 | 3.3 | 0.8 | 2 | 5.5 | +370 / +200 | 15 |
| TDO | XO [3] | 0.8 | 2.3 | 3.3 | 0.8 | 2 | 5.5 | -370 / -195 | 15 |
| TRST; RSV1; TDI; /BREQ | I | - | - | - | 0.8 | 2 | 5.5 | -350 / -215 | 8 |
| RSV0; RDY; /BGRANT | XO [3] | 0.8 | 2.3 | 3.3 | 0.8 | 2 | 4.6 | -350 / -215 | 12 |
| /STCON | I | - | - | - | 0.8 | 2 | 3.6 | -340 / -225 | 15 |
| FLMDO | I | - | - | - | 0.8 | 2 | 5.5 | +350 / +220 | 8 |
| /PORST | connected to /PORST ECU connector | | | | | | | | |

Pin Type:
I: Input, X: Tristate, O: Output, OD: Open Drain

[1] negative value pulls signal to High, positive value pulls signal to Low
[2] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[3] max 12 mA

## 7.12.2 ECU Interface Connector CON1

| Signal | Pin Type | $V_{OL}$ (max) [V] | $V_{OH}$ (min) [V] | $V_{OH}$ (max) [V] | $V_{IL}$ (max) [V] | $V_{IH}$ (min) [V] | $V_{IH}$ (max) [V] | Leakage current [1] [µA] | Additional load by ETK [2] (typ) [pF] |
|---|---|---|---|---|---|---|---|---|---|
| /TRST | XO [3] | 0.8 | 2.3 | 3.3 | - | - | - | +3320 / +2380 | 10 |
| TCK | XO [3] | 0.8 | 2.3 | 3.3 | - | - | - | +3320 / +2380 | 16 |
| TMS | XO [3] | 0.8 | 2.3 | 3.3 | - | - | - | +3320 / +2380 | 15 |
| TDI | XO [3] | 0.8 | 2.3 | 3.3 | - | - | - | +3320 / +2380 | 9 |
| TDO | I | - | - | - | 0.8 | 2 | 5.5 | -370 / -195 | 15 |
| RDY | I | - | - | - | 0.8 | 2 | 5.5 | +25 / -20 | 21 |
| /PORST | IXOD [4] | 0.7 | - | - | 0.8 | 2 | 5.5 | +25 / -20 | 21 |
| FMLD0 (WDGDIS) | XO [3] | 0.8 | 2.3 | 3.3 | - | - | - | +20 / -20 | 9 |
| /AUDSYNC; AUDCK; AUDMD; AUDRST | XO [3] | 0.8 | 2.3 | 3.3 | - | - | - | +20 / -20 | 8 |
| AUD0; AUD1; AUD2; AUD3 | XO [3] | 0.8 | 2.3 | 3.3 | 0.8 | 2 | 5.5 | +20 / -20 | 12 |

Pin Type:
I: Input, X: Tristate, O: Output, OD: Open Drain

[1] negative value pulls signal to High, positive value pulls signal to Low
[2] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[3] max. 12 mA
[4] max. 0.2 A

## 7.13 Pin Assignment

### 7.13.1 ECU Interface Connector CON1

| Pin | Signal | Direction | Comment |
|---|---|---|---|
| B11 | TCK | Output | JTAG Signal |
| A5 | TMS | Output | JTAG Signal |
| B4 | TDO | Input | JTAG Signal |
| B3 | /TRST | Output | JTAG Signal |
| A15 | /RDY | Input | JTAG Signal |
| A16 | /PORST | Bidir | ECU Power On Reset signal (open drain) for Reset assertion and supervision |
| B16 | FLMD0 | Output | Flash mode pin |
| B17 | RSV1 | Input | Reserved Input |
| B15 | VDDP (Sense) | Input | Sense for Switched power supply of ECU (ignition) |
| B5 | TDI | Output | JTAG Signal |
| B18 | Autodetect | Input | Detect ETK Adapter |
| A22 | /AUDSYNC | Output | AUD signal |
| A23 | AUDMD | Output | AUD signal |
| A24 | AUD1 | Input/Output | AUD signal |
| A25 | AUD3 | Input/Output | AUD signal |
| B22 | AUDCK | Output | AUD signal |
| B23 | AUDRST | Output | AUD signal |
| B24 | AUD0 | Input/Output | AUD signal |
| B25 | AUD2 | Input/Output | AUD signal |
| A1; A2; A3; A4; A7; A8; A9; A10; A12; A13; B1; B2; B7; B8; B12; B13 | Do not use | | Do not connect this pin |
| A17; A19; A20; A25; B9; B10 | Reserved | | Not connected |
| B6; B14 | 3.3 V Permanent | Power | For internal use only |
| A6; A11; A14; A18; A21; B19; B20; B21 | GND | Power | Signal Ground |

### 7.13.2 ECU Power Connector CON2

| Pin | Signal | Direction | Comment |
|---|---|---|---|
| 1 | Ubatt | Input | Car battery |
| 2 | Cal_Wakeup | Output | Pin not used |
| 3 | GND | Input | Power GND |
| 4 | NA | | Pin not used |
| 5 | VDDPSTBY (3.3 V Supply) | Output | Permanent power supply 3.3 V |

### 7.13.3 Power Connector CON3

| Pin | Signal | Direction | Comment |
|---|---|---|---|
| 1 | Ubatt | Input | Additional car battery input |
| 2 | Reserved | | not connected |

### 7.13.4 Debugger Interface Connector CON5

| Pin | Signal | Direction | Comment |
|---|---|---|---|
| 11 | TCK | Input | JTAG Signal |
| 1 | TMS | Input | JTAG Signal |
| 3 | TDO | Output | JTAG Signal |
| 7 | TDI | Input | JTAG Signal |
| 9 | TRST | Input | JTAG Signal |
| 8 | /PORST | Bidir | Directly connected to ECU /PORST |
| 10 | /RDY | Output | JTAG Signal |
| 12 | /STCON | Input | Debugger Detect Signal |
| 16 | RSV1 | Input | Reserved Input |
| 5 | RSV0 | Output | N.C. |
| 13 | BRKIN | Input | N.C. |
| 14 | FLMD0 | Input | Mode pin |
| 15 | /BGRANT | Output | Bus Grant |
| 2 | VREF | Output | Target supply for sensing |
| 4; 6 | GND | Power | Signal Ground |

## 7.14 Mechanical Dimensions

The reference measure for all drawings is millimeter

.

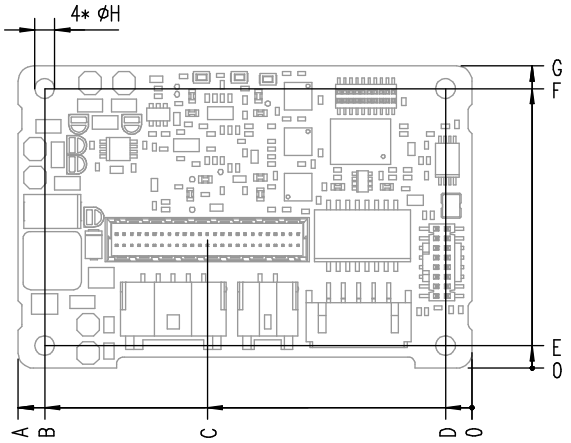


**Fig. 7-3** ETK-S22.0A Dimensions - Top View

| Item | Dimension [Millimeters] | Tolerance [Millimeters] | Dimension [Inches] | Tolerance [Inches] |
|---|---|---|---|---|
| A | 60.00 | +0.2/-0.2 | 2.362 | +0.008/-0.008 |
| B | 56.50 | +0.1/-0.1 | 2.224 | +0.004/-0.004 |
| C | 35.00 | +0.2/-0.2 | 1.380 | +0.008/-0.008 |
| D | 3.50 | +0.1/-0.1 | 0.138 | +0.004/-0.004 |
| E | 3.00 | +0.1/-0.1 | 0.118 | +0.004/-0.004 |
| F | 37.00 | +0.1/-0.1 | 1.457 | +0.004/-0.004 |
| G | 40.00 | +0.2/-0.2 | 1.575 | +0.008/-0.008 |
| H | 2.60 | +0.1/-0.0 | 0.102 | +0.004/-0.000 |

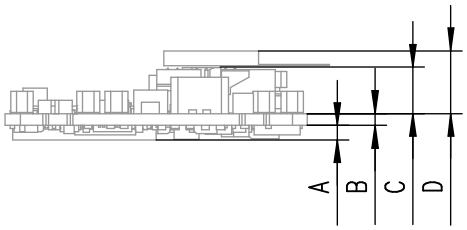


**Fig. 7-4** Mechanical Dimensions ETK-S22.0A: Microcontroller with Socket Adapter mounted

| Item | Dimension [Millimeters] | Tolerance [Millimeters] | Dimension [Inches] | Tolerance [Inches] |
|---|---|---|---|---|
| A | 2.10 | +0.1/-0.1 | 0.083 | +0.004/-0.004 |
| B | 1.60 | +0.16/-0.16 | 0.063 | +0.006/-0.006 |
| C | 6.00 | +0.1/-0.1 | 0.236 | +0.004/-0.004 |
| D (ETAL1) | 8.00 | +0.1/-0.1 | 0.315 | +0.004/-0.004 |
| D (ETAL4) | 8.76 | +0.1/-0.1 | 0.344 | +0.004/-0.004 |

# 8 Cables and Accessories

## 8.1 Interface Cables

### 8.1.1 Cable KA54 (with PG Cable Gland)

**NOTE**

Cable glands are not included in the delivery. Refer to the cable descriptions for manufacturers and order numbers.

#### 8.1.1.1 Cable KA54, Proposal 1

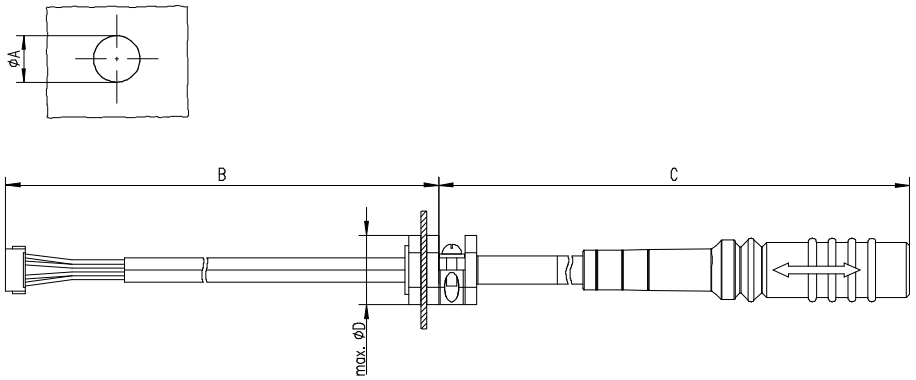


**Fig. 8-1** Interface Cable KA54, Proposal 1

| Dim | Millimeters | Inches | Dim | Millimeters | Inches |
|---|---|---|---|---|---|
| **A** | 12.50 | 0.492 | **C** | 400.00 | 15.748 |
| **B** | 160.00 | 6.299 | **D** | 19.00 | 0.748 |

**NOTE**

Shield **connected** to ECU housing.

*SKINDICHT compact screwing; Manufacturer: Lapp; Description: SH7; Order-No.: 5200 0830*

*Nut for compact screwing; Manufacturer: Lapp; Description: SM7; Order-No.: 5200 3490*

### 8.1.1.2 Cable KA54, Proposal 2

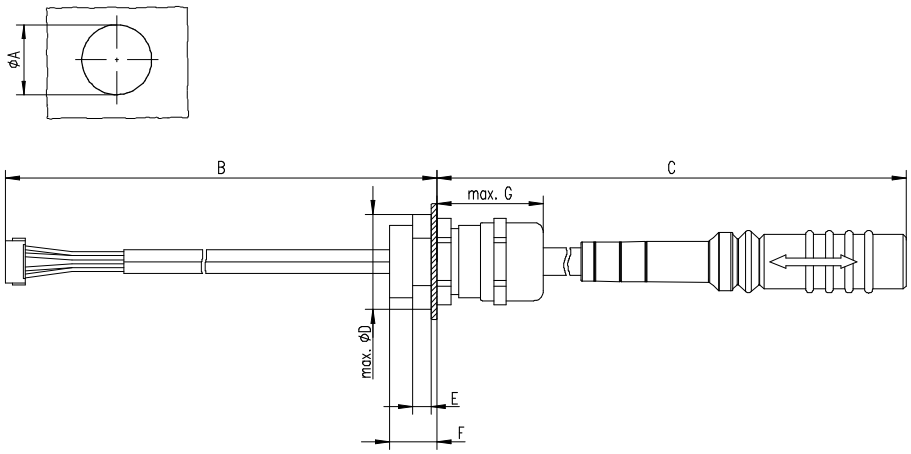


**Fig. 8-2** Interface Cable KA54, Proposal 2

| Dim | Millimeters | Inches |
|---|---|---|
| **A** | 18.80 | 0.740 |
| **B** | 160.00 | 6.299 |
| **C** | 400.00 | 15.748 |
| **D** | 24.25 | 0.955 |
| **E** | 4.70 | 0.185 |
| **F** | 12.00 | 0.472 |
| **G** | 27.00 | 1.063 |

**NOTE**

*Shield* **connected** *to ECU housing.*

*SKINTOP compact screwing; Manufacturer: Lapp; Description: MS-SC 11 ; Order-No.: 5311 2320*

*Nut for compact screwing; Manufacturer: Lapp; Description: SM-PE 11 ; Order-No.: 5210 3220*

## 8.1.2 Cable KA55

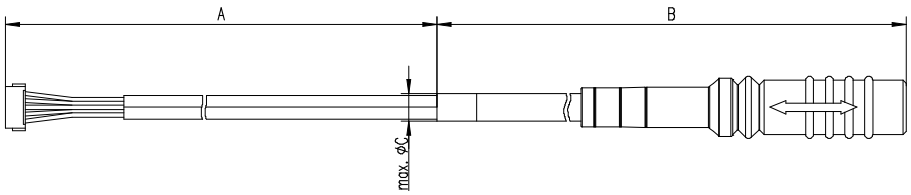


**Fig. 8-3** Interface Cable KA55

| Dim | Millimeters | Inches |
|---|---|---|
| **A** | 160.00 | 6.299 |
| **B** | 400.00 | 15.748 |
| **C** | 9.00 | 0.3543 |

**NOTE**

Strain relief on ECU cover necessary. Shield **not connected** to ECU housing.

## 8.1.3 Cable CBAM200

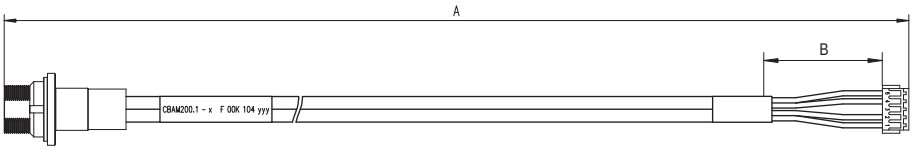


**Fig. 8-4** Interface Cable CBAM200-0m38

| Dim | Millimeters | Inches |
|---|---|---|
| **A** | 380.00 | 14.96 |
| **B** | 30.00 | 1.18 |

**NOTE**

Shield connected to ECU housing, allows for ECU housing flush mounting.

### 8.1.4 Cable CBAM261

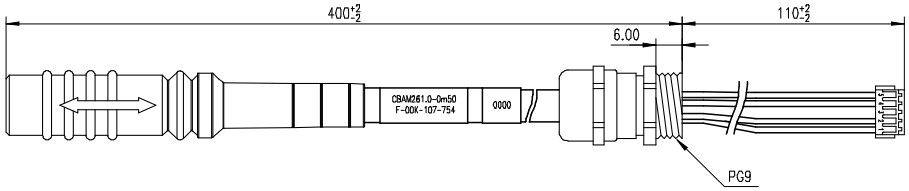


**Fig. 8-5** Interface Cable CBAM261

ETK interface cable (100 MBit) for the ETKS_C3 water proofed case with shield pre-mounted in PG9 screwing.

**NOTE**

*Shield* **connected** *to ECU housing.*

## 8.2 Power Supply Cables

### 8.2.1 Cable K70.1

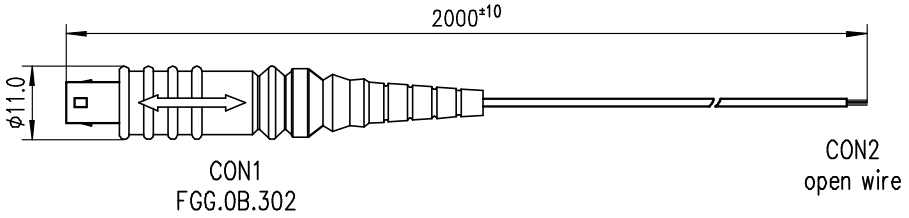


**Fig. 8-6** Power Supply Cable K70.1

| Dim | Millimeters | Inches |
|---|---|---|
| **A** | 2000 | 78.74 |

### 8.2.2 Cable KA50

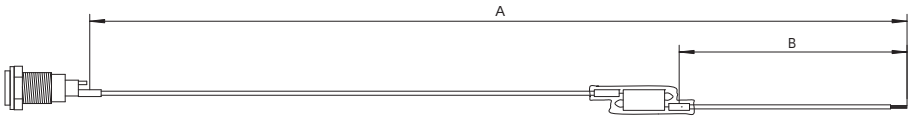


**Fig. 8-7** Power Supply Cable KA50

| Dim | Millimeters | Inches |
|---|---|---|
| **A** | 200 | 7.87 |
| **B** | 50 | 1.97 |

### 8.2.3 Cable ETV3

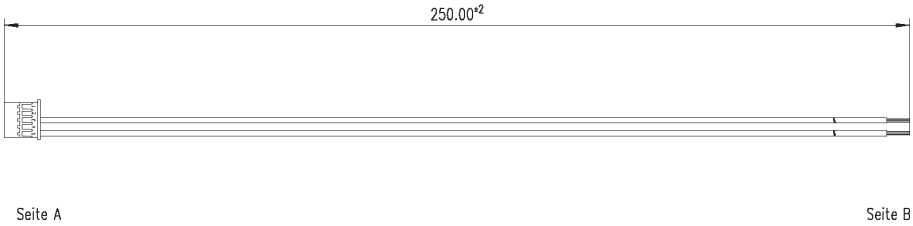


**Fig. 8-8** Power Supply Cable ETV3

| Dim | Millimeters | Inches |
|---|---|---|
| **A** | 250 | 9,84 |

## 8.3 Combined Interface and Power Supply Cables

### 8.3.1 Cable CBAM210

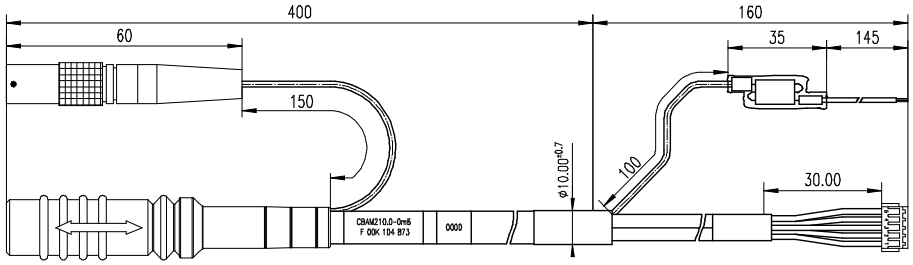


**Fig. 8-9** Combined Interface and Power Supply Cable CBAM210

> **NOTE**
>
> Shield **not connected** to ECU housing.

### 8.3.2 Cable CBAM220

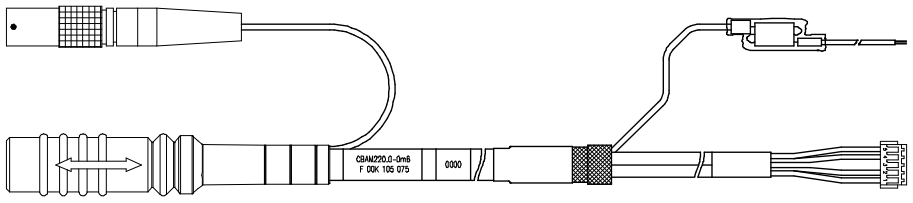


**Fig. 8-10** Combined Interface and Power Supply Cable CBAM220

For cable CBAM220 dimensions refer to dimensions of cable CBAM210 in Fig. 8-9.

> **NOTE**
>
> *Shield* **connected** *to ECU housing.*

### 8.3.3 Cable CBAM260

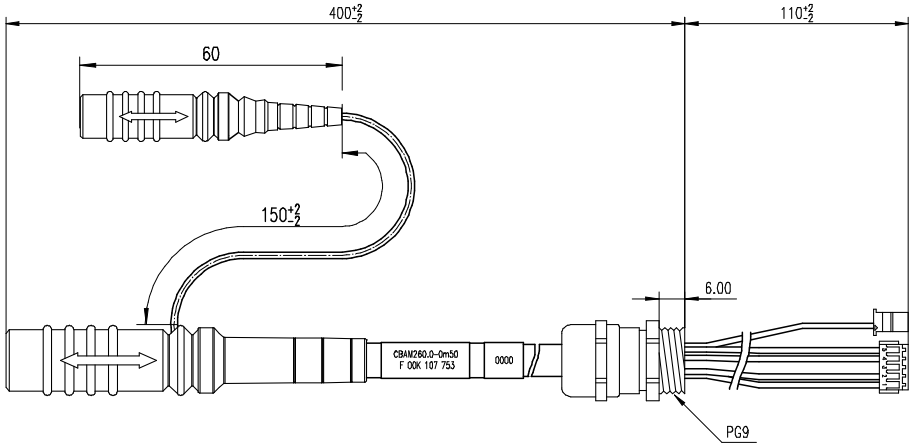


**Fig. 8-11** Combined Interface and Power Supply Cable CBAM260

Combined ETK interface and power supply cable (100 MBit) for the ETKS_C3 water proofed case with shield pre-mounted in PG9 screwing.

**NOTE**

*Shield* **connected** *to ECU housing.*

## 8.4 Adapters

### 8.4.1 ETK - ECU Adapter ETAL1

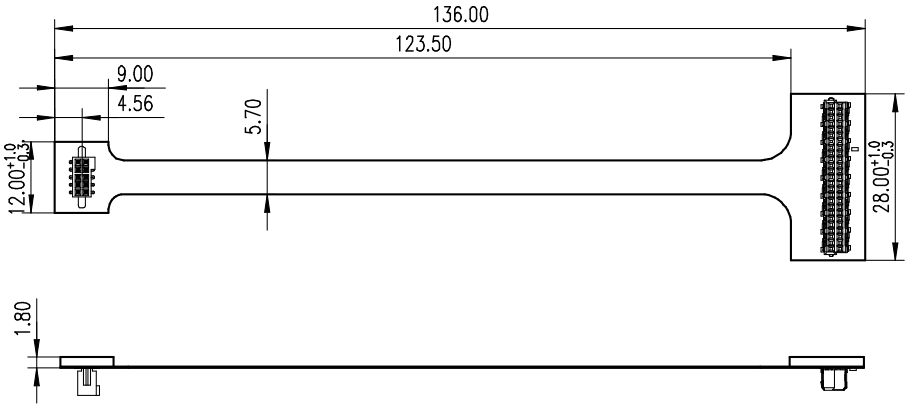


**Fig. 8-12** ETK - ECU Adapter ETAL1

In order to be able to use the ETK adapter ETAL1 in the ECU, a 10 pin SAMTEC connector (e.g. TFM-105-02-S-D-P) must be available on the ECU.

| Pin | JTAG Mode | Description |
|---|---|---|
| 1 | GND | CPU Ground |
| 2 | TCK | Microcontroller signal (3.3 V) |
| 3 | /TRST | Microcontroller signal (3.3 V) |
| 4 | TDO | Microcontroller signal (3.3 V) |
| 5 | TMS | Microcontroller signal (3.3 V) |
| 6 | TDI | Microcontroller signal (3.3 V) |
| 7 | Tristate | High impedance |
| | WDGDIS | "Watchdog Disable" |
| | FLMD0 | If debugger is connected: "Flash mode pin 0" (ETK signal to ECU) |
| 8 | VDD (Sense) | Supply of JTAG/ DAP |
| 9 | /RDY | Microcontroller signal (3.3 V) |
| 10 | /PORESET | Power on reset (3.3 V) |

## 8.4.2 ETK - ECU Adapter ETAL4

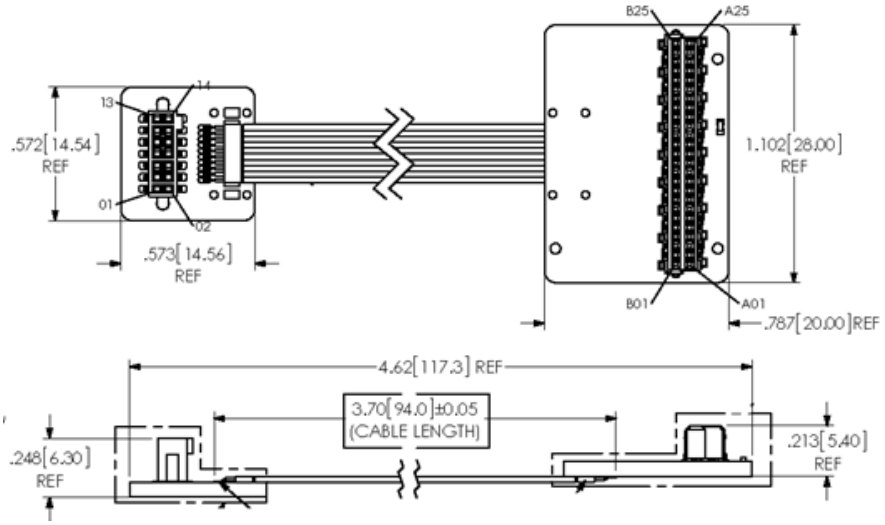


**Fig. 8-13** ETK - ECU Adapter ETAL4

The ETAL4 adapts ECU with 14 pin SAMTEC connector to an ETK-S22. Supported is AUDR Interface. The adapter is passive and signals are routed single ended to the ETK.

In order to be able to use the ETK adapter ETAL4 in the ECU, a 14 pin SAMTEC connector (e.g. TFM-107-02-S-D-P) must be available on the ECU.

| Pin | AUD Mode | Description |
|---|---|---|
| 1 | GND | CPU Ground |
| 2 | AUDCK | Microcontroller signal (3.3 V) |
| 3 | /AUDRST | Microcontroller signal (3.3 V) |
| 4 | NC | |
| 5 | AUDMD | Microcontroller signal (3.3 V) |
| 6 | /AUDSYNC | Microcontroller signal (3.3 V) |
| 7 | NC | |
| 8 | VDD (Sense) | Supply of AUDR |
| 9 | NC | |
| 10 | /POR | Power on reset (3.3 V) |
| 11 | AUDD0 | Microcontroller signal (3.3 V) |
| 12 | AUDD1 | Microcontroller signal (3.3 V) |
| 13 | AUDD2 | Microcontroller signal (3.3 V) |
| 14 | AUDD3 | Microcontroller signal (3.3 V) |

### 8.4.3 ETK - ECU Adapter ETAL5

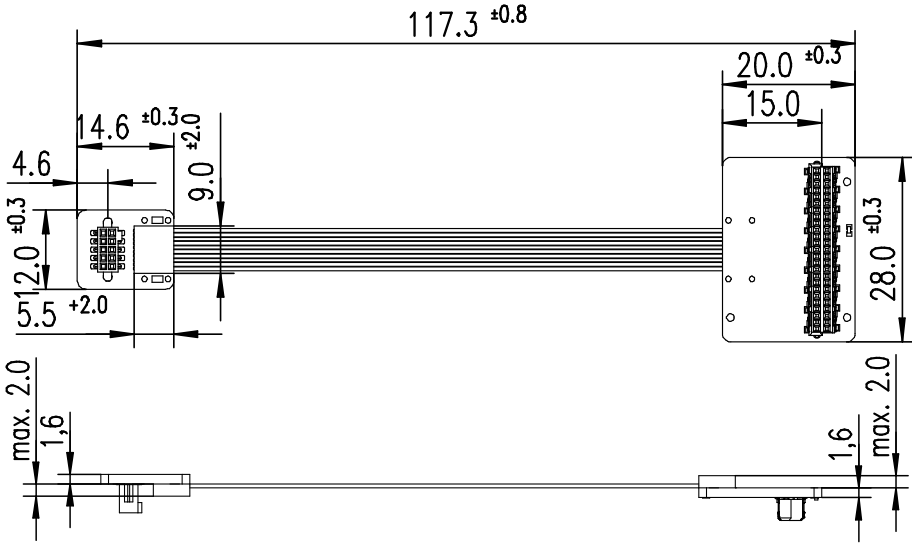


**Fig. 8-14** ETK - ECU Adapter ETAL5

## 8.5 Water proofed case ETKS_C3

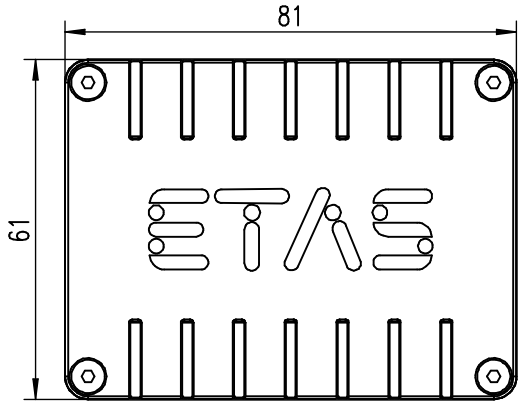


**Fig. 8-15** ETKS_C3 Top View

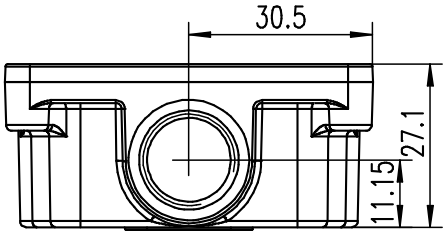


**Fig. 8-16** ETKS_C3 Side View

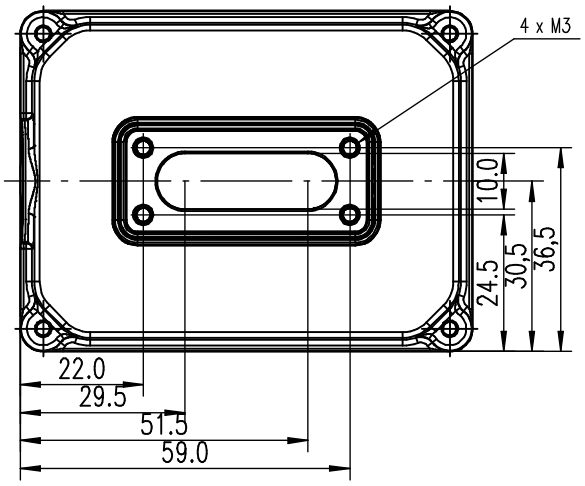


**Fig. 8-17** ETKS_C3 Bottom View

# 9 Ordering Information

## 9.1 ETK-S22.0A

| Order Name | Short Name | Order Number |
|---|---|---|
| ETK-S22.0A Emulator Probe for Renesas RH850\C1x and RH850\E1x Family | ETK-S22.0A | F 00K 109 126 |

**Package Contents**

- ETK-S22.0A Emulator Probe for Renesas RH850\C1x and RH850\E1x Family
- List "Content of this Package"
- ETK Safety Advice
- China-RoHS-leaflet_Compact_cn

## 9.2 ETK - ECU Adapter

| Order Name | Short Name | Order Number |
|---|---|---|
| ETAL1 ETK ECU Adapter, Erni - Samtec (50fc - 10fc), 0m136 | ETAL1 | F00K 107 679 |
| ETAL4 ETK ECU Adapter, Erni - SAMTEC (50fc - 14fc) 0m1 | ETAL4 | F00K 109 127 |
| ETAL5 ETK ECU Adapter, Erni - SAMTEC (50fc - 10fc), 0m1 | ETAL5 | F00K 109 414 |

## 9.3 Debug Adapter

| Order Name | Short Name | Order Number |
|---|---|---|
| Debug Adapter from Debugger to ETK-S2x | ETAF11 | F00K 107 682 |

## 9.4 Cables

Please contact your local ETAS representative for further cable information.

**NOTE**

The cables showed in chapter “Cables and Accessories” on page 45 are not included in the ETK-S22.0A delivery.

**NOTE**

The screws for mounting ECU adapter cables are not included in the cable delivery. They need to be ordered separately.

### 9.4.1 Interface Cables

| Order Name | Short Name | Order Number |
|---|---|---|
| ETK ECU Adapter Cable, Shield on ECU-Housing, Lemo 1B PHG JST PHR (4fc-5fc), 0m6 [1)] | KA54 | F 00K 001 302 |
| ETK ECU Adapter Cable, Lemo 1B PHG JST PHR (4fc-5fc), 0m6 [2)] | KA55 | F 00K 001 303 |

[1)]: ETK grounded via ECU housing
[2)]: ETK grounded via cable

### 9.4.2 Power Supply Cables

| Order Name | Short Name | Order Number |
|---|---|---|
| ETK Power Supply Cable, JST PAP – open wires (5fc-2c), 0m25 | ETV3 | F 00K 109 141 |
| External Power Supply Cable fo ETKs, Lemo 0B - FGG open wires (2fc-1c), 2m | K70.1 | F 00K 109 270 |
| ETK Power Supply Cable for External Supply, with Filter Coil, Lemo 0B EGG - open wire (2fc-1c), 0m2 | KA50 | F 00K 000 940 |

### 9.4.3 Combined Interface and Power Supply Cables

| Order Name | Short Name | Order Number |
|---|---|---|
| ETK ECU Adapter and Power Supply Cable, Lemo 1B PHG - JST PHR (4fc-5fc) / Lemo 0B PHG - open wires (2fc-2c), 0m6 | CBAM210-0m6 | F 00K 104 873 |
| ETK ECU Adapter and Power Supply Cable, Shield on ECU-Housing, Lemo 1B PHG - JST PHR (4fc-5fc) / Lemo 0B PHG - open wires (2fc-2c), 0m60 | CBAM220-0m6 | F 00K 105 075 |
| ETK ECU Adapter and Power Supply Cable, pre-assembled into PG9 screwing, shield on ECU-Housing, Lemo 1B PHG - JST PHR (4fc-5fc) / Lemo 0B PHG - JST PAP (2fc-2fc), 0m50 | CBAM260-0m5 | F 00K 107 753 |
| ETK ECU Adapter Cable, pre-assembled into PG9 screwing, shield on ECU- Housing, Lemo 1B PHG - JST PHR (4fc-5fc), 0m50 | CBAM261-0m5 | F 00K 107 754 |

## 9.5 Water proofed case ETKS_C3

| Order Name | Short Name | Order Number |
|---|---|---|
| Water proofed case, designed for ETK-S4.x, ETK-S6.x and ETK-S2x | ETKS_C3 | F 00K 107 683 |

# 10 ETAS Contact Addresses

## ETAS HQ

ETAS GmbH

| | | |
|---|---|---|
| Borsigstraße 24 | Phone: | +49 711 3423-0 |
| 70469 Stuttgart | Fax: | +49 711 3423-2106 |
| Germany | WWW: | www.etas.com |


## ETAS Subsidiaries and Technical Support

For details of your local sales office as well as your local technical support team and product hotlines, take a look at the ETAS website:

| | | |
|---|---|---|
| ETAS subsidiaries | WWW: | www.etas.com/en/contact.php |
| ETAS technical support | WWW: | www.etas.com/en/hotlines.php |

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