ETAS

DRIVING EMBEDDED EXCELLENCE

ETAS FETK-S1.1 Emulator Probe for Infineon AURIX MCU Family

User Guide

www.etas.com

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FETK-S1.1 - User Guide R09 EN - 07.2021

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 moderate 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 his 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 in the Courier font. Meaning and usage of each command are ex-plained 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 in small caps.
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, pro-gram 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 14
	Symbol for CE conformity, see chapter 2.6.1 on page 14
	UKCA conformity symbol (Great Britain), see chapter 2.6.2 on page 14)
	Symbol for China RoHS, see chapter 2.7.2 on page 15
	Symbol for China RoHS, see chapter 2.7.2 on page 15
	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, PO Box 300220, 70442 Stuttgart, 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 14) 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 7A and 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 FETK-S1.1 is an emulator probe for the Infineon AURIX microcontroller family. It is a serial FETK designed for use with the DAP interface (IEEE/ISTO 5001).

NOTE

For supported Infineon AURIX microcontrollers, refer to chapter 7.1.3 on page 39.

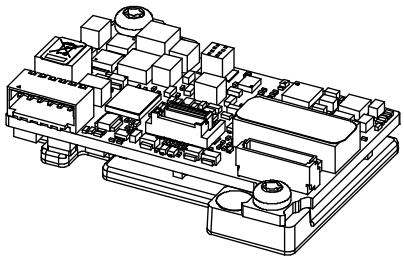


Fig. 3-1 FETK-S1.1

	FETK-S1.1
ECU interface connector	20 pin FCI
Power supply connector	6 pin MOLEX
Power supply for ED devices (VDDSBRAM)	1.3 V
SBRAM sense	Yes
Pinless triggering	Yes
Timer triggering	Yes

To access the ECU the FETK-S1.1 has to be connected via ETAS ES89x ECU and Bus Interface Modules.

The system can be used for high speed Measurement, Calibration and ECU flash programming. Support of Rapid Prototyping applications e.g. functional prototyping - bypass depends on the functionality of the connected modules.

The FETK-S1.1 and ES89x system uses the standardized protocol “XCP on Ethernet” for PC communication. Thus 3rd party tools can be connected to the ECU as well.

3.2 Features

3.2.1 General

- Gigabit Ethernet Interface:
  - Connection to PC via ES89x modules
  - Proprietary Ethernet protocol for FETKs
  - Supports a variety of standard applications
- Calibration tool access performed via the microcontroller DAP interface
  - 3.3 V DAP output levels, 5.0 V tolerant DAP input
  - Configurable DAP interface modes:
    2-pin DAP mode, clock speed 50 MHz and100 MHz)
    3-pin DAP mode (wide mode), clock speed 100 MHz and 160 MHz
- Permanent storage of configuration in EEPROM
- Third party MC-tool support via ES89x module possible

3.2.2 Measurement

- Fast measurements (DISTAB) – ECU raster at under 50 µs
- Measurement via Trace2Ram for low ECU runtime impact and fast rasters down to 10 µs
- Supports “turnkey mechanism” - measurement start immediately after “Ignition on” and proceed measurement during ECU reset
- Pin-less ECU handshake and trigger mechanism
- Hook-based (DISTAB) and hook-less measurement approaches

3.2.3 Calibration

- Concurrent use of calibration and measurement performed via microcontroller debug interface
- Working Page & Reference Page (2 page concept) realized by microcontroller overlay mechanism
- Direct access to parameters, curves, and maps in internal RAM
- Microcontroller capability of internal Flash emulation can be used
- FETK powers Emulation Device RAM (for calibration purpose)
- Supports “Start on Any Page”
- Supports special coldstart mechanism (“Calibration Wake Up”):
  - Calibration Wake Up: Wake up mechanism to wake up the power supply of the ECU via the Calibration Wake up pin
  - Pull CalWakeUp until Startup Handshake: duration of the Wake up mechanism is configurable

3.2.4 ECU Flash Programming via FETK

- Using microcontroller debug interface, ECU software support not necessary
- Braindead flashing under ProF control

3.2.5 Further Characteristics

- “ETK Drivers and Tools” update to support ETAS software tools (INCA, XCT)
- Firmware update (programming of the logic device) through HSP software service packs; removal of FETK or ECU is not necessary
- Mounting possibilities inside or on top of ECU
- Temperature range suitable for automotive application

For more technical data on the FETK-S1.1 consult the chapter “Technical Data” on page 38.

4 Hardware Description

This chapter contains information about the following topics:

4.1 Architecture

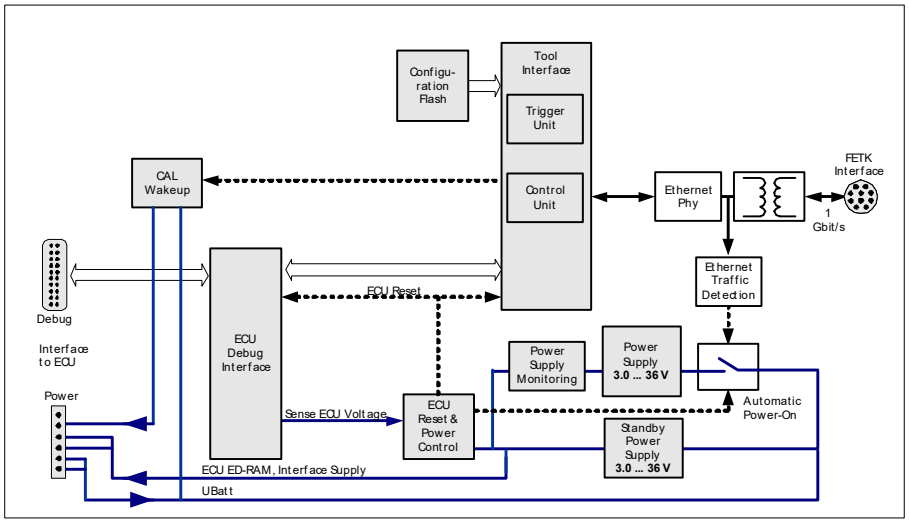


Fig. 4-1 FETK-S1.1 Architecture

While the microcontroller accesses the program data (not the program code) out of the data emulation memory provided by the microcontroller, the content of the data emulation memory can simultaneously be modified by the calibration and development system through the FETK-S1.1 Ethernet 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 provide data to the calibration and development system by buffering the data (DISTAB17) and triggering the FETK-S1.1 to read the data via DAP.

The FETK-S1.1 then reads, buffers, processes and sends this measured data to the PC.

If no additional measurement data memory is available, the FETK-S1.1 can alternatively read the data to be measured directly from the microcontroller's memory. This process is Triggered Direct Measurement (TDM) with DISTAB17.

The 100/1000 Mbit/s Ethernet interface provides communication with the ES89x module.

FETK Connector	Description
CON1	ECU Interface
CON2	Power supply
CON3	Ethernet interface (ETAS module or PC)

4.2 ECU Interface

The FETK-S1.1 is connected via connectors CON1 and CON2 to the ECU with two adapter cables (refer to Fig. 4-2 on page 21). 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 FETK power supply, but only for detection of the ECU status, therefore the power consumption on this line is negligible (refer to chapter 4.5 on page 24)
- 1 Reset line which allows the FETK to control and monitor the system reset of the ECU
- 1 Reset line which allows the FETK to monitor the system reset of the ECU
- 5 Debug line interfaces for the communication between the FETK-S1.1 and the microcontroller
- 1 Watchdog disable line
- 1 ground line

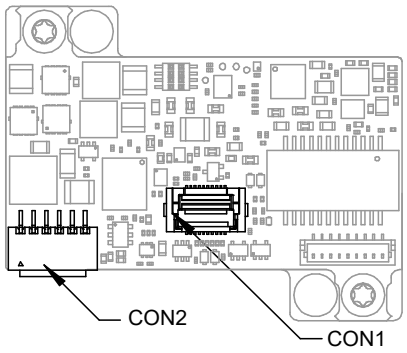


Fig. 4-2 Location of the ECU Interfaces

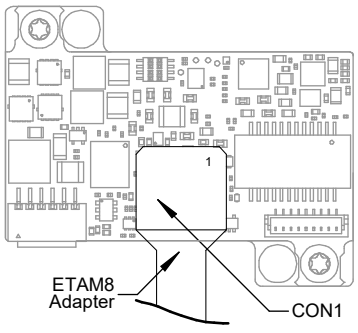


Fig. 4-3 ETAM8 Adapter mounted at CON1

4.3 FETK Ethernet Interface

The FETK Ethernet interface utilizes a proprietary Ethernet protocol. It has to be connected to the PC via a ES89x ECU Interface Module at CON3 (refer to Fig. 4-4).

NOTE

The FETK Ethernet interface utilizes a proprietary Ethernet protocol and is compatible only with the Gigabit Ethernet interfaces of the ES89x ECU Interface Module.

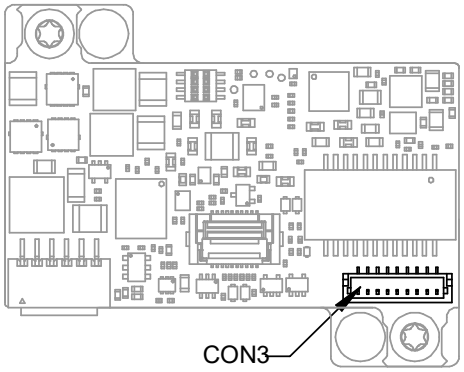


Fig. 4-4 Location of the FETK Ethernet Interface Connector (CON3)

4.4 DAP Interface

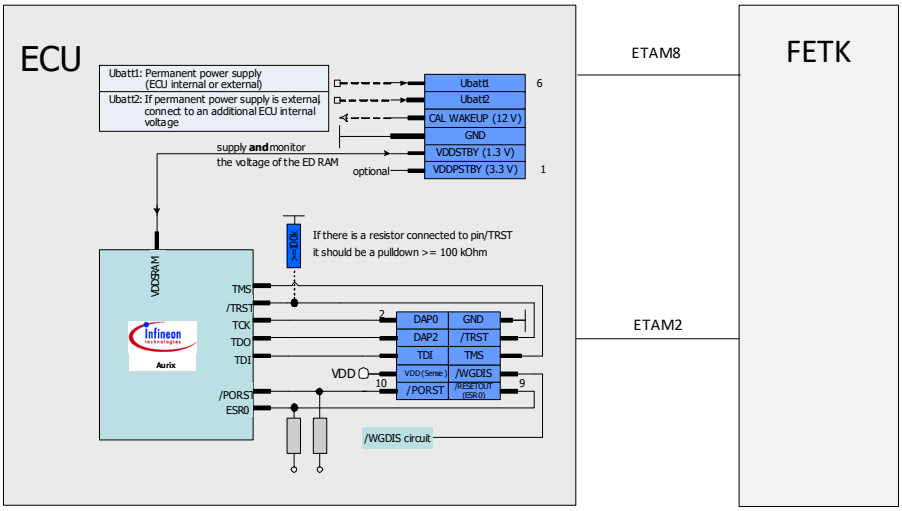


Fig. 4-5 Equivalent Circuitry of the ECU DAP Interface (ECU)

The FETK-S1.1 Device Access Port (DAP) interface is configurable and operates in the 2-pin or in the 3-pin mode (wide mode).

Supported DAP modes:

- 2-pin DAP mode: one data pin (direction via protocol), one clock pin
- 3-pin DAP mode: two data pins (bidirectional, direction via protocol), one clock pin

The 2-pin DAP mode is the FETK-S1.1 DAP interface default mode.

4.5 Power Supply

The FETK-S1.1 requires a permanent power supply. It is typically powered directly from the car battery. The input voltage may vary (see chapter 7.5 on page 41). In case of higher input voltages to the FETK, additional voltage protection is required.

The FETK-S1.1 will also accept voltage dips down to 3 V (for additional details of low voltage operation, see ISO standard 16750).

From the input battery voltage, switch-mode power supplies provide all necessary voltages on the FETK-S1.1. The power supply of the ECU is not affected by the FETK-S1.1. An automatic switch ensures that the power supply of the FETK-S1.1 is automatically switched on and off when the FETK enters and leaves its standby (sleep) mode.

The FETK-S1.1 is supplied with power through the connector CON2.

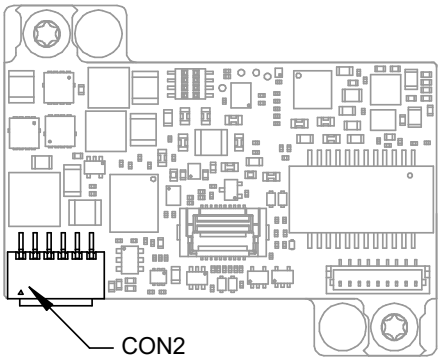


Fig. 4-6 Location of the Power Supply Connector

4.6 ECU Voltage Supervisor

The ECU voltage (VDDP) is monitored by the FETK to recognize whether the ECU is switched on or off. Additionally the ECU RAM standby voltage (VDDSBRAM) is monitored to determine if the standby RAM content is still valid. These two signals are only used for monitoring therefore the load current is negligible.

NOTE

The FETK-S1.1 only allows switching between reference page and working page if there is a valid voltage at the sense pin and the working page has been initialized by the calibration and development system.

The FETK-S1.1 monitors the VDDSBRAM supply on board the FETK. The microcontroller's standby power supply pin must be connected to the FETK pin VDDSBRAM.

4.7 Data Emulation and Data Measurement

The FETK-S1.1 is a serial FETK using DAP as the primary microcontroller interface. Typical of all serial ETKs, XETKs and FETKs, the RAM used for data emulation and data measurement is not accessible by the FETK until the microcontroller is powered up and the startup handshake is performed.

Serial FETKs use the ETAS two page concept, consisting of both a Reference and a Working page.

The Reference Page is located in the ECU flash and can not be modified by a simple write access. All changes to the Reference Page must be done via Flash programming.

The Working Page is typically located within the microcontroller's ED RAM. The Working Page may be a portion of or the entire size of the ED RAM. The ED RAM used for the emulation of calibration data must not be used by the ECU software directly as general purpose RAM. It is recommended that the ED RAM is permanently powered by the FETK or ECU. The FETK/INCA has the complete control over the RAM used as Working Page and it's contents. When enabling data emulation, the FETK establishes a basic start-up configuration of the data in the Working Page by copying the corresponding data in the Flash to the emulation space.

To enable calibration, the Working Page must be activated. The process of switching from the Reference Page to the Working Page and vice versa is known as page switching.

The FETK-S1.1 supports Protocol Based page switching for all supported microcontrollers. Page switching is done in microcontroller software by switching the overlay memory on (Working Page) and off (Reference Page) using microcontroller overlay registers. The FETK-S1.1 does not directly control the microcontroller overlay registers. Instead the FETK-S1.1 and microcontroller software use a simple communication method with a shared mailbox in RAM. The FETK uses this mailbox to request and monitor page switching; the microcontroller software is responsible to service this mailbox and perform the page switches. Using an overlay modification description, also in RAM, the FETK provides the necessary information of how the overlay registers need to be modified to realize the page switch which is requested.

The FETK-S1.1 can access both the Reference Page and the Working Page, regardless of which is active from the microcontroller’s point of view.

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

4.8 Trace Based Measurement

The microcontroller ability to send trace messages is used to forward any write access to measurement data to CPU internal buffer (Trace2Ram / Trace to RAM). This buffer is automatically read by the FETK-S1.1 via the DAP interface.

The FETK-S1.1 combines the processing of this data trace messages with an initial direct read of the configured measurement data to an always up to date mirror of the measurement data in the ECU. The current values will be sent from the FETK-S1.1 to INCA every time the ECU software issues the corresponding trace trigger.

For details on trace trigger (refer to chapter 4.11.1 on page 27).

The FETK-S1.1 does the complete configuration of the microcontroller for trace based measurement. No ECU software is required for the configuration.

As trace based measurement has to transfer trace data, address and some by-catch via DAP interface it is less efficient compared to DISTAB17 non-trace measurement regarding DAP interface usage. But it has lower impact on ECU runtime and faster rasters are possible.

4.9 Trigger Modes: Overview

The FETK-S1.1 supports the following trigger modes:

- Pinless triggering
- Timer triggering
- Trace triggering by value

4.10 Pinless Triggering

The trigger mode "Pinless Triggering" uses the microcontroller's internal Development Trigger Semaphore (DTS) for triggering.

4.10.1 Startup Handshake

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

4.10.2 FETK Trigger Generation

4.10.2.1 Initialization

After the startup handshake and measurement is enabled, the FETK is waiting for triggers from the ECU software.

4.10.2.2 Application running

To generate triggers, the ECU software sets bits in the trigger register "CBS_TRIG" by writing the associated bits in the trigger setting register "CBS_TRIGS".

Each bit of the trigger setting register "CBS_TRIGS" corresponds to a bit in the same position in the trigger register "CBS_TRIG", each of them corresponding to an FETK hardware trigger.

The FETK periodically polls the trigger register "CBS_TRIG" via IO_READ_TRIG for detecting triggers. The polling rate is determined by the fastest measurement raster and is configurable with a 50 µs default.

Active bits in trigger register "CBS_TRIG" are automatically cleared by the CPU when the register is read by the FETK-S1.1 via IO_READ_TRIG.For generating triggers, the ECU software sets bits in the trigger register "CBS_TRIG" by writing the associated bits in the trigger setting register "CBS_TRIGS".

4.11 Timer Triggering

The trigger mode "Timer Triggering" uses four internal timers of the FETK-S1.1 for triggering. A fixed configurable period is used for triggering.

The time intervals between trigger events are in accordance with the configured timer values. This values and their resolution have to be defined in the A2L file. Available settings are:

- Minimum time interval 100 µs
- Maximum period duration 1 s
- Timer resolution 1 µs

The timers work in an asynchronous manner to the ECU.

4.11.1 Trace Triggering

The FETK-S1.1 provides support for up to 255 trace triggers. The trace triggers are defined within a section of RAM covered by a trace window. Both the trace window and trace triggers are defined in the FETK-S1.1 configuration and/or A2L file. A write by the microcontroller software to a trace trigger location causes a trace trigger. The trace trigger events to the FETK-S1.1 are synchronous to the microcontroller software. Variables assigned to a measurement raster using a trace trigger are acquired from the FETK-S1.1 trace mirror, not directly via DAP. The FETK-S1.1 supports value based data trace trigger up to 255 value.

Requirements for trace triggering by the FETK-S1.1:

- the triggers for different rasters/events have same address, but use different values
- the address must be 32 bit aligned
- the write must be 32 bit width (the upper 24 bits must be ‘0’)
- the value 0x0 is not a valid trigger number

NOTE

It is not possible to use the FETK-S1.1 configured with trace triggers and a debugger with program / data trace simultaneously.

4.12 Reset

The requirement for the FETK-S1.1 reset mechanism is to ensure that power-up and power-down behavior of ECU is clean and smooth. The FETK-S1.1 normally drives /PORST low or upon INCA request.

The signals /PORST and /ESR0 of the microcontroller are used by the FETK-S1.1 to detect when the ECU is in reset.

NOTE

The reset signal /PORST can be hold or pulled low while the FETK-S1.1 is booting depending on the use the adapter ETAM8A or the adapter ETAM8B (see chapter “ETAM8 Adapter” on page 60). The FETK-S1.1 has to be configured in the XCT tool according to the needed reset signal characteristic during ETK standby.

The FETK-S1.1 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 FETK to enter the power save mode with the calibration system unplugged.

4.13 Pull CalWakeUp until Startup Handshake

The FETK has the ability to wake up the ECU by applying voltage to the CalWakeUp pin of the ECU connector. This allows the FETK to configure a measurement while the ECU is off.

When waking up the ECU via the CalWakeUp pin, it can be configured if the pin is driven high until the microcontroller core voltage (VDDP) is high or if the pin should be driven high until the start-up handshake between ECU and FETK is complete.

5 Installation

This chapter contains information about the following topics:

5.1 Mounting the FETK-S1.1 into the ECU Housing

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.

CAUTION

Risk of short circuiting the internal signals of the FETK!

When mounting the FETK to the ECU, ensure that the screws and washers used will not penetrate the FETK printed circuit board.

5.1.1 Thermal Connection Requirements

The FETK-S1.1 is assembled with a heatspreader and can be operate inside the metal ECU housing without cooling. To do this, there must be a distance of a few millimeters between the FETK-S1.1 heat spreader and the ECU housing.

A thermal connection (completely or partially) from the FETK heat spreader to the ECU housing should be preferred.

CAUTION

Risk of overheating the FETK-S1.1!

To avoid overheating of the FETK-S1.1 the connection to the ECU housing following requirements for thermal conductivity must be met:

- ECU housing thermal conductivity at the FETK-S1.1 mounting position: >2.5 W/ (m · K), guaranteed by size and material of the ECU housing and
- heat conductive paste thermal conductivity: >0.75 W/(m¬·¬K).

5.1.2 Mounting Material

To mount the FETK-S1.1 to the ECU housing several materials are required:

- FETK-S1.1
- ECU metal housing with machined holes aligning with FETK-S1.1 hole pattern (see chapter “Mechanical Dimensions” on page 55
- Heat conductive paste with a thermal conductivity > 0.75 W/ (m · K)

- Two screws M2.5
  - cylinder head, countersunk-, self-sealing screw
  - length depending on the ECU project:
    (≥ [2.5 mm to 4 mm] + wall thickness ECU housing)
- Screwdriver T8

5.1.3 Mounting Steps

To mount the FETK-S1.1 to the ECU housing several mounting steps are required:

Preparing the ECU Housing

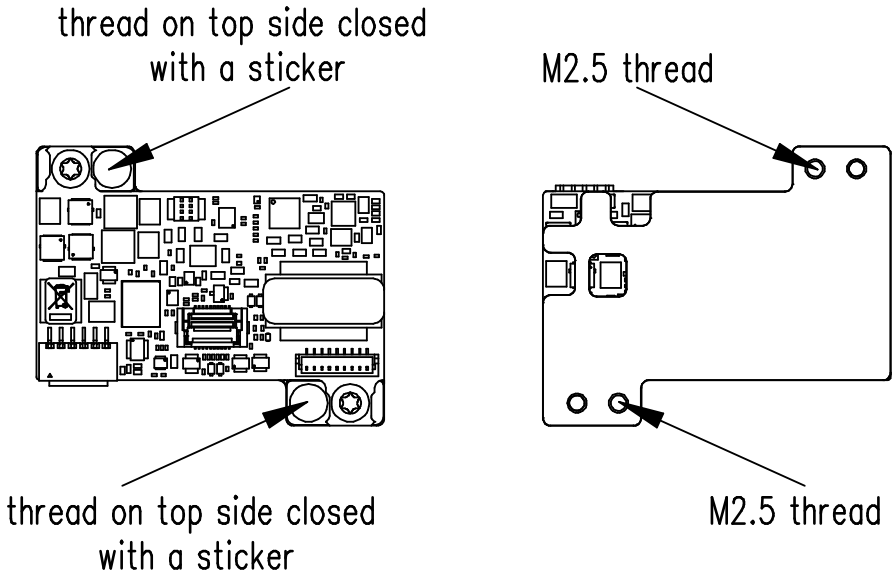


Fig. 5-1 FETK-S1.1 Threads and Heat Spreader

1. Drill two holes in the ECU housing.

> **NOTE**
>
> Use the Fig. 7-7 on page 48 as a drilling template to prepare the ECU housing with machined holes aligning with FETK-S1.1 hole pattern.

Preparing the FETK-S1.1

2. Apply a thin layer of heat conductive paste to the bottom side of the FETK-S1.1 heat spreader.

Attaching the FETK-S1.1 to the ECU Housing

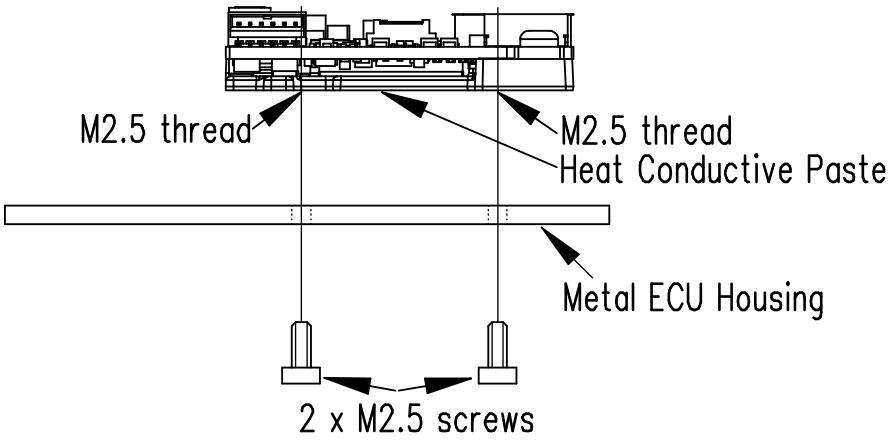


Fig. 5-2 Attaching the FETK-S1.1 to the ECU

1. Align the threaded drill holes of the FETK-S1.1 to the openings in the ECU housing.
2. Insert the screws into the holes in the ECU housing.
3. Screw the screws into the FETK-S1.1.

NOTE

Screw the two parts together without getting them off-thread.

NOTE

Screw the FETK-S1.1 onto the ECU housing using exclusively M2.5 screws with a max. torque of 0.9 Nm.

The FETK-S1.1 and the ECU housing are now connected mechanically.

5.2 Connection to the ECU

For connecting the FETK-S1.1 to the ECU two FETK adapter cables are recommended:

- at CON1 adapter cable ETAM8A or ETAM8B (see chapter 4.12 on page 28 and chapter 8.9 on page 60)
- at CON2 adapter cable ETAM2 or ETAM5

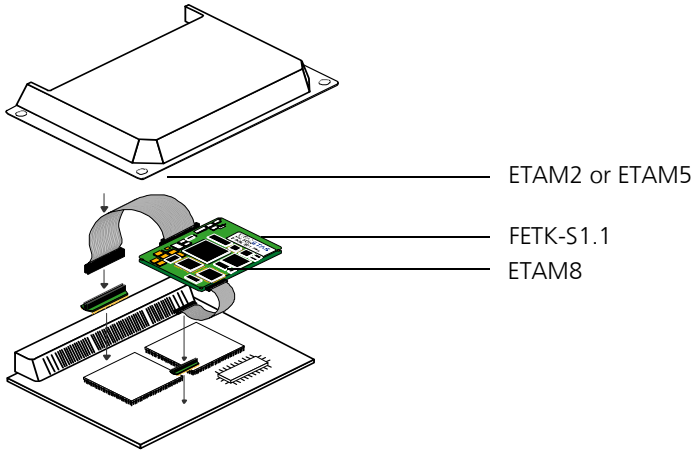


Fig. 5-3 FETK-S1.1 Connection to the ECU

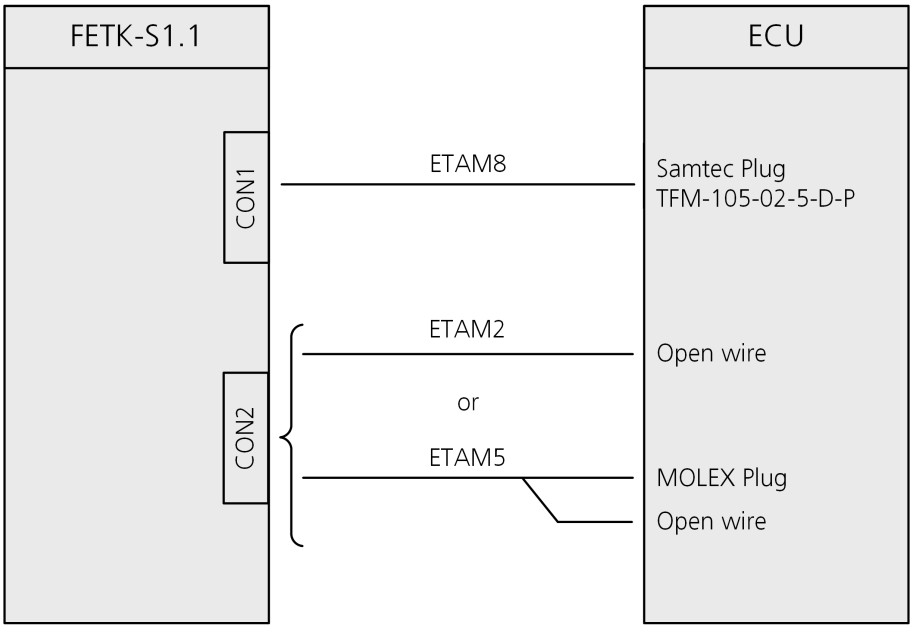


Fig. 5-4 FETK-S1.1 Adapter Cable to the ECU

5.3 Wiring

5.3.1 FETK Ethernet Interface

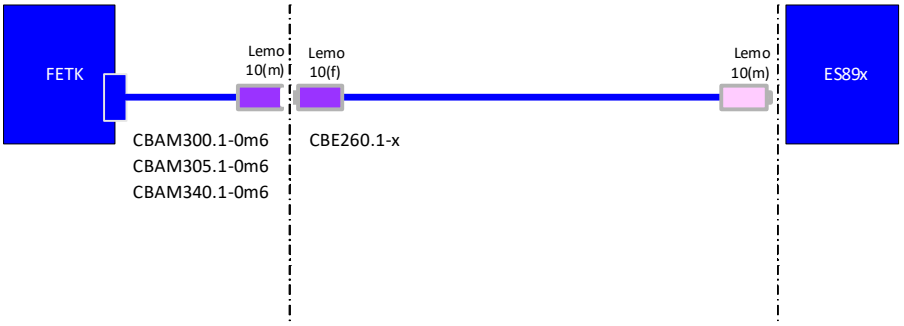


Fig. 5-5 Wiring - FETK Ethernet Interface

The FETK Ethernet interface can be connected to the ES89x ECU and Interface Module.

> **NOTE**
>
> The FETK Ethernet interface utilizes a proprietary Ethernet protocol and is compatible only with the Gigabit Ethernet interfaces of the ES89x ECU Interface Module.

5.3.2 Power Supply

The FETK-S1.1 needs a permanent power supply.

5.3.2.1 Permanent Power Supply inside ECU available

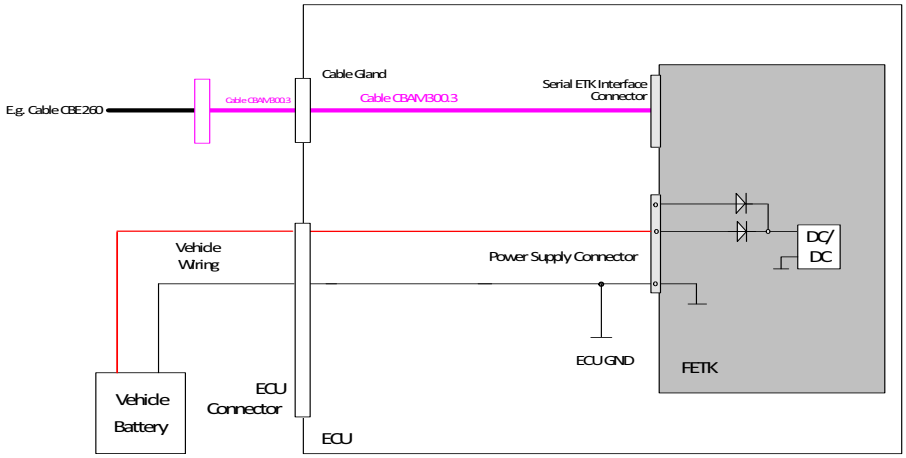


Fig. 5-6 FETK-S1.1 Power Supply wiring with CBAM300.3 Cable

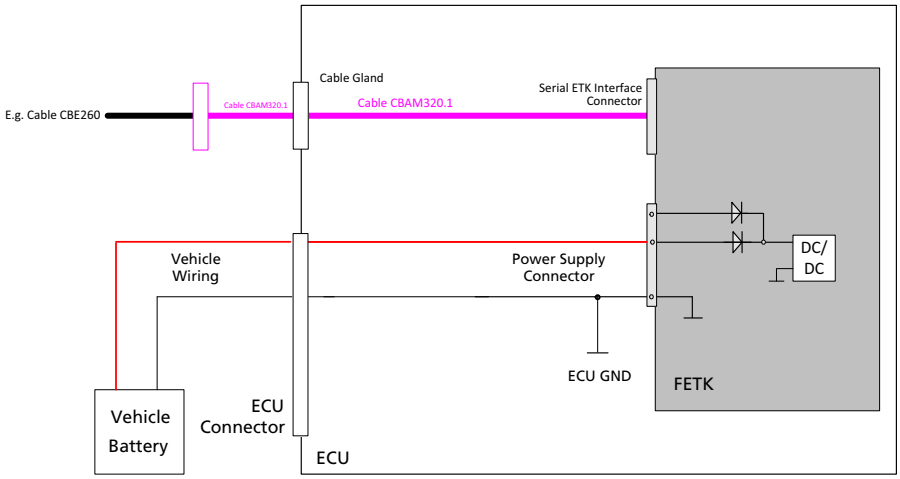


Fig. 5-7 FETK-S1.1 Power Supply wiring with CBAM320.1 Cable

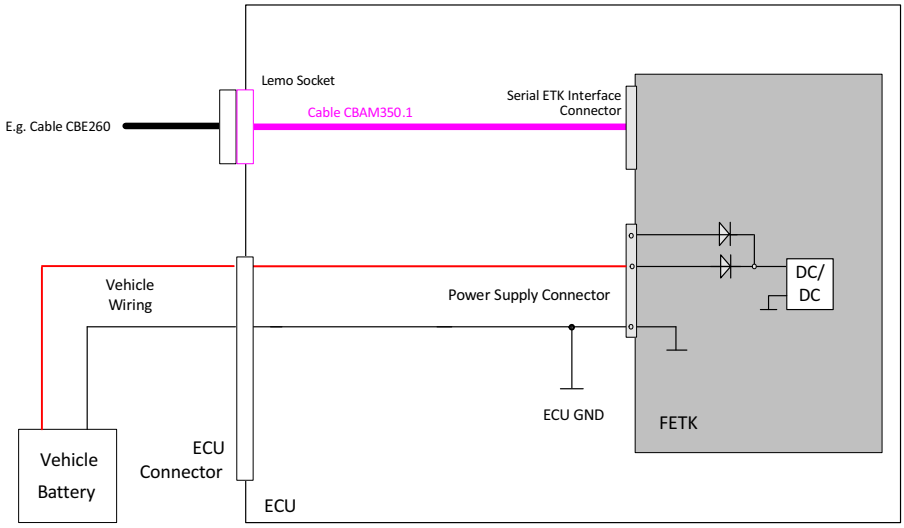


Fig. 5-8 FETK-S1.1 Power Supply wiring with CBAM350.1 Cable

5.3.2.2 Permanent Power Supply inside ECU not available

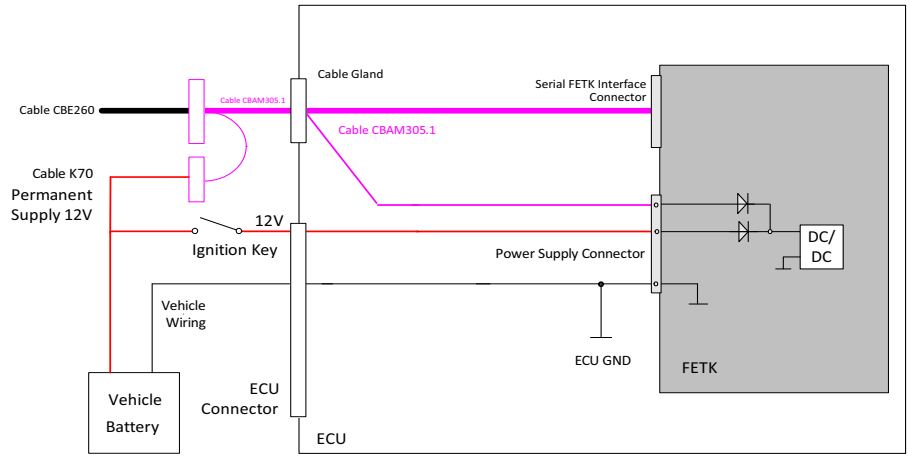


Fig. 5-9 FETK-S1.1 Power Supply wiring with CBAM305.1 Cable

5.3.2.3 Isolated Power Supply inside ECU

The FETK-S1.1 does not require a galvanically isolated power supply. For special applications ETAS can offer a isolated power supply unit.

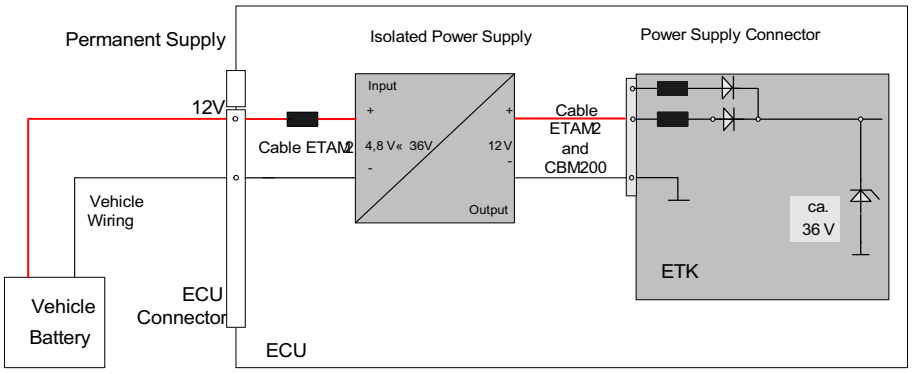


Fig. 5-10 Isolated Power Supply inside ECU

The ETP2 is connected between the permanent power supply and the FETK-S1.1 power supply connector (see Fig. 5-10 on page 35). The ETK is connected to the ETP2 using the CBM200 cable.

6 ETK / XETK / FETK Configuration

This chapter contains information about the following topics:

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 ETK / XETK / FETK Configuration Tool (XCT). The XCT contains information on all available ETKs, XETKs, and FETKs. The user is supported through a graphical interface.

The configuration is done in two steps:

1. 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.

2. Connection of the ETK / XETK / FETK to the ECU.

   The ECU hardware developer defines the connection of the ETK / XETK / FETK 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 XCT can create the following output:

- Direct ETK / XETK / FETK configuration
- Storage of the configuration in a data file
- The corresponding ASAP2 input

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

- Overlay Region definitions
- Memory Segment definitions
- ETK / XETK / FETK configuration features
- Raster definitions
- Trace windows (in the case of trace measurement)

If these parameters are entered correctly in the corresponding ECU description file, it guarantees that every time the calibration system is started, the ETK / XETK / FETK is checked for the appropriate configuration.

If necessary, the ETK / XETK / FETK will be configured appropriately to the corresponding project.

6.2 Configuration Parameter

The XCT provides support concerning hardware configuration parameters and their possible values.

They are described for the different ETK / XETK / FETK types in the help document of the XCT.

Starting the XCT help

1. Start XCT.

   The main window of XCT opens.

2. Select in the menu bar **? > Contents**.

   The XCT help window opens.

3. Choose **Reference to User Interface > (X)ETK Hardware Configuration Parameters**.

4. Choose the topic **FETK-S1.1**.

   The topic **FETK-S1.1** contains information about the FETK-S1.1 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

ETAS Hardware: ES89x ECU Interface Modules

7.1.2 PC with one Ethernet Interface

A PC with one open Ethernet interface (1 Gbit/s) with RJ-45 connection is required to connect the ES89x module. 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

You need the following software versions to support the FETK-S1.1. Operating the FETK-S1.1 with older software versions is not possible.

7.1.3.1 FETK-S1.1A

Microcontroller	HSP	INCA	ETK Tools	ASCET-RP	INTECRIO
TC26x-ED	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC26x-PD	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC27x-ED C-step [1)]	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC27x-PD	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC29x-ED	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC29x-PD	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2

[1)]: and higher microcontroller versions (steps) if they support the C-step specifications

7.1.3.2 FETK-S1.1B

Microcontroller	HSP	INCA	ETK Tools	ASCET-RP	INTECRIO
TC33x PD	V12.0.0	V7.3.0	V4.2.0	V6.4.3	V4.6.2
TC36x PD	V11.15.0	V7.2.15	V4.1.16	V6.4.3	V4.6.2
TC37x PD	V11.15.0	V7.2.15	V4.1.16	V6.4.3	V4.6.2
TC37x-ED	V11.12.0	V7.2.12	V4.1.13	V6.4.3	V4.6.2
TC38x-PD	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC39x-ED A-step	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC39x-ED B-step [1)]	V11.8.0	V7.2.8	V4.1.9	V6.4.3	V4.6.2
TC37x-XX	V12.3.0	V7.3.4	V4.2.3	V6.4.3	V4.6.2
TC39x-XX	V12.3.0	V7.3.4	V4.2.3	V6.4.3	V4.6.2

[1)]: and higher microcontroller versions (steps) if they support the B-step specifications

The configuration instructions for the FETK-S1.1 under INCA and HSP are contained in the relevant software documentation.

To support Trace to RAM you need the following software versions:

- HSP V11.10.0
- INCA V7.2.11
- ETK Tools V4.1.11

Supporting Trace to RAM with older software versions is not possible.

7.2 Data Emulation and Measurement Memory

7.2.1 Data Emulation Memory and Microcontroller Support

The FETK-S1.1 uses a portion of or up to the entire size of the ED RAM, to emulate data in internal flash. The following table lists the supported microcontrollers, the size of the ED RAM, and states if the ED RAM is capable of being powered using a standby supply.

Microcontroller	Max. ED RAM	Standby powered
TC26x-ED	512 kByte	Yes
TC27x-ED	1 MByte	Yes
TC29x-ED	2 MByte	Yes
TC37x-ED	3 MByte	Yes
TC39x-ED	4 MByte	Yes
TC37x-XX	3 MByte	t.b.d.
TC39x-XX	4 MByte	t.b.d.

7.2.2 Measurement Data Memory

Item	Characteristics
Location	Typically located within the emulation memory when using DISTAB17 hooks. Measurement data memory can be located in internal RAM if the entire ED RAM is needed for calibration.
Update	Logic devices updated using HSP software

7.3 FETK Ethernet Interface

Item	Characteristics
Connection	1 Gbit/s Ethernet
Cable length	max. 30 m / 100 ft
Ethernet Interface	DC decoupling

NOTE

The FETK Ethernet interface utilizes a proprietary Ethernet protocol and is compatible only with the Gigabit Ethernet interfaces of the ES89x ECU Interface Module.

7.4 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)	II

7.5 Power Supply

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Permanent power supply (car battery)	U_{Batt}	Vehicle usage [1)]	6.0 [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	16	25	mA
Operating current	I_{Batt}	U_{Batt} = 12 V; no load from ECU; T = 20 °C	50	95	170	mA
Power consumption	P_{Batt}	U_{Batt} = 12 V; I = 0 mA at pin ECU_SBRAM; T = 20 °C		1.14		W
Power consumption	P_{Batt}	U_{Batt} = 12 V; I = 500 mA at pin VDDSTBY [1.25 V]; I = 80 mA at pin VDDPSTBY; T = 20 °C		2.4		W

[1)] The FETK-S1.1 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 FETK-S1.1 will accept permanent power supply voltage dips (for additional details of 3 V low voltage operation, see ISO standard 16750).

7.6 Microcontroller Interface

	Symbol	Condition	Min	Typ	Max	Unit
ECU Standby RAM Output Voltage	VDDSTBY	max. 500 mA load	1.27	1.32	1.36	V
VDDPSTBY Output Voltage	VDDP-STBY	max. 80 mA load	3.14	3.3	3.46	V
Cal_Wakeup Output Voltage	CAL_WAKEUP	U_{Batt} = 6 - 36 V; load = 0 - 50 mA	U_{Batt}-1 V		U_{Batt}	V
ECU Power Supply Supervision Voltage (3.3 V selected)	VDDP	ECU on	2.67	2.77	2.89	V
		ECU off	2.44	2.56	2.68	V
	IDDP	VDDP 3.3 V			800	µA
ECU Standby RAM Supervision Voltage (1.25 V selected)	VDDSTBY /VDDST-BY_SENSE	VDDSTBY ↑	1.03	1.07	1.1	V
		VDDSTBY ↓	1.02	1.06	1.08	V
	IDDSTBY	VDDSTBY 1.30 V			50	µA

7.7 Test Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Start Up Time 1 [1)]	$t_{startup1}$	U_{Batt} = 12 V ECU_VDDP goes high	0		6	ms
Start Up Time 2 [1)]	$t_{startup2}$	U_{Batt} goes high	180		670	ms

[1)] /PORST is not pulled low until FETK start up time

7.8 DAP Timing Characteristics

The FETK-S1.1 supports two DAP modes:

- 2-pin DAP mode: one data pin (direction via protocol), one clock pin
- 3-pin DAP mode: two data pins (bidirectional, direction via protocol), one clock pin

The 2-pin DAP mode is the FETK-S1.1 DAP interface default mode.

NOTE

DAP timing parameters in this chapter refer to the DAP interface (CON1) of the FETK-S1.1. The DAP wiring to the ECU (ETAM1) 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.

7.8.1 2-Pin DAP Mode

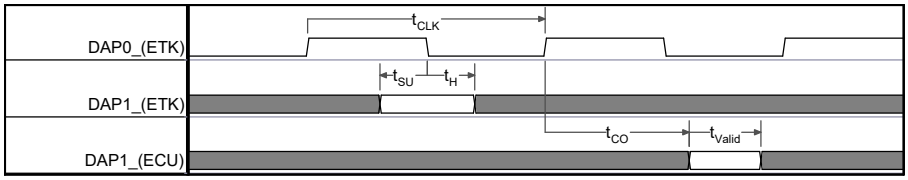


Fig. 7-1 2-Pin DAP Mode Timing

Parameter	Symbol	Value [ns]	Comment
DAP0 Clock Period (typ.) (ETK --> Target)	t_{CLK}	10	100 MHz DAP Clock Frequency
		20	50 MHz DAP Clock Frequency
DAP1 Set-Up Time (ETK --> Target)	t_{SU}	4	
DAP1 Hold Time (ETK --> Target)	t_H	2	
DAP1 Clock-to-Out Time (Target --> ETK)	t_{CO}	~	Undetermined, ETK automatically determines optimum sampling point
DAP1 Valid Window (Target --> ETK)	t_{Valid}	8	

7.8.2 3-Pin DAP Mode

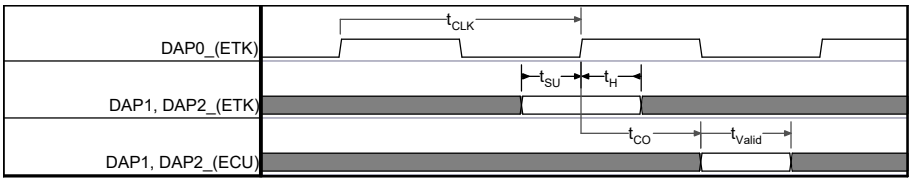


Fig. 7-2 3-Pin DAP Mode Timing

Parameter	Symbol	Value [ns]	Comment
DAP0 Clock Period (typ.) (ETK --> Target)	t_{CLK}	6.25	160 MHz DAP Clock Frequency
		20	50 MHz DAP Clock Frequency
DAP1/DAP2 Set-Up Time ETK --> Target)	t_{SU}	4	
DAP1/DAP2 Hold Time (ETK --> Target)	t_H	2	
DAP1/DAP2 Clock-to-Out Time (Target --> ETK)	t_{CO}	~	Undetermined, ETK automatically determines optimum sampling point

7.9 Electrical Characteristics

7.9.1 ECU Interface Connector

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 (min / max) [µA]	Additional load by ETK (typ) [pF][1)]
DAP0	XO [2)]	0.7	2.3	3.3	-	-	5.5	+745 / +475	16
DAP1	IXO [2)]	0.7	2.3	3.3	0.8	2	5.5	+5000 / +3340	16
DAP2	IXO [2)]	0.7	2.3	3.3	0.8	2	5.5	+5000 / +3340	16
Reserved	XO [2)]	0.7	2.3	3.3	-	-	6.5	+20 / -20	10
/TRST	XO [2)]	0.7	2.3	3.3	-	-	6.5	-705 / -485	10
/ESR0	IXOD [3)]	0.7	-	-	0.8	2	6.5	+25 / -20	22
/PORST	IXOD [3)]	0.7	-	-	0.8	2	6.5	+25 / -20	22
WGDIS	XO [2)]	0.7	2.3	3.3	-	-	6.5	+10 / -10	10
GATE_PORST	I	-	-	-	0.8	3	3.8	+195 / +135	15
DAPE0	XO [2)]	0.7	2.3	3.3	-	-	5.5	+745 / +475	16
DAPE1	IXO [2)]	0.7	2.3	3.3	0.8	2	5.5	+5000 / +3340	16
DAPE2	IXO [2)]	0.7	2.3	3.3	0.8	2	5.5	+5000 / +3340	16

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

[1)] Adapter cable and Samtec connector not considered; PCB 1 pF/cm
[2)] max 12 mA
[3)] max 0.2 A

7.10 Pin Assignment

> **NOTE**
>
> The tables describes the pin assignment at the ETK side.

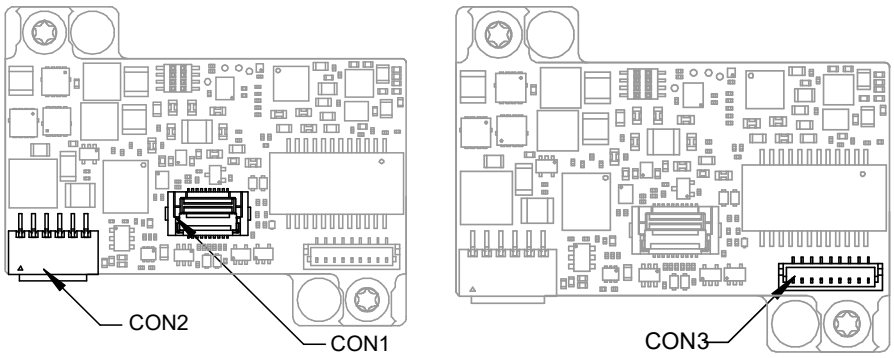


Fig. 7-3 Location of the FETK-S1.1 Interfaces

7.10.1 ECU Interface Connector CON1 (JTAG Mode)

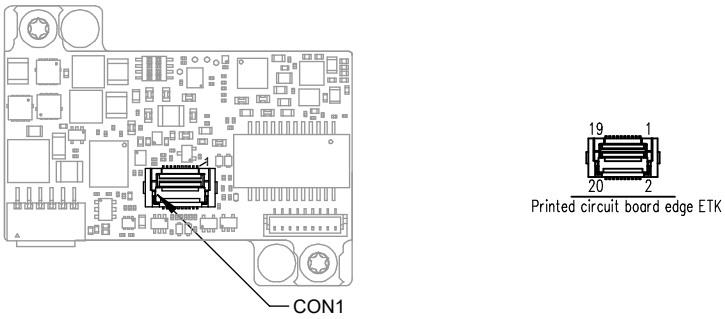


Fig. 7-4 ECU Inteface Connector CON1

Pin	Signal	Direction	Comment
1	DAP0	Output	DAP signal
2	/TRST	Output	DAP signal
3	GND	Power	Signal ground
4	DAP2	Bidir	DAP signal
5	WDGDIS	Output	Watchdog disable signal
6	GND	Power	Signal ground
7	VDDP (Sense)	Input	Sense for switched power supply of ECU (ignition)
8	DAP1	Bidir	DAP signal
9	GND	Power	Signal ground
10	RESERVED (TDI)	Output	Reserved
11	/ESR0	Bidir	ECU reset signal (open drain) for reset assertion and supervision

Pin	Signal	Direction	Comment
12	GND	Power	Signal ground
13	/PORST	Bidir	ECU power on reset signal (open drain) for reset assertion and supervision
14	DNU	Output	DNU, Mfr test signal
15	DAPE2	Bidir	DAPE signal
16	DNU	Output	DNU, Mfr test signal
17	DAPE1	Bidir	DAPE signal
18	GATE_PORST	Input	Overwrite /PORST status at power on, 0 V = /PORST inactive, 3.3 V = active
19	DAPE0	Output	DAPE signal
20	GND	Power	Signal ground

7.10.2 Power Supply Connector CON2

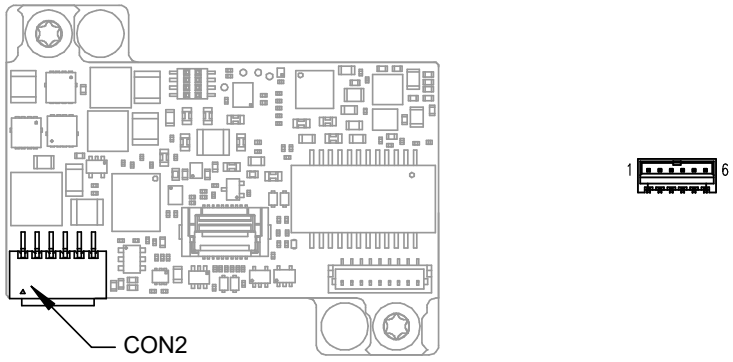


Fig. 7-5 Power Supply Connector CON2

Pin	Signal	Direction	Comment
1	VDDPSTBY (3.3 V supply)	Output	Permanent power supply of ECU JTAG Interface, 3.3 V
2	VDDSTBY (1.30 V supply)	Output	Permanent power supply of ECU EDRAM, 1.30 V
3	GND	Input	Power GND
4	CalWakeup	Output	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Ubatt2	Input	Vehicle battery
6	Ubatt1	Input	Vehicle battery

NOTE

VDDSTBY may not be used as power supply of the microcontroller core. VDDSTBY is permanently available and must be used as power supply of the EDRAM, only.

7.10.3 FETK Ethernet Interface Connector CON3

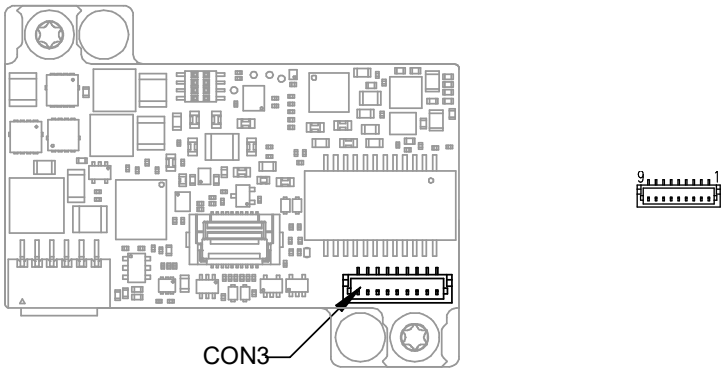


Fig. 7-6 FETK Ethernet Interface Connector CON3

7.11 Mechanical Dimensions

The reference measure for all drawings is millimeters.

Item	Dimension [Millimeters]	**Dimension** [Inches]
Length	46.00	1.811
Width	37.00	1.4567
Height [1)]	13.10	0.5157

[1)]: CBAM300/ CBAM305/ CBAM340 mounted at CON3

7.11.1 Top View

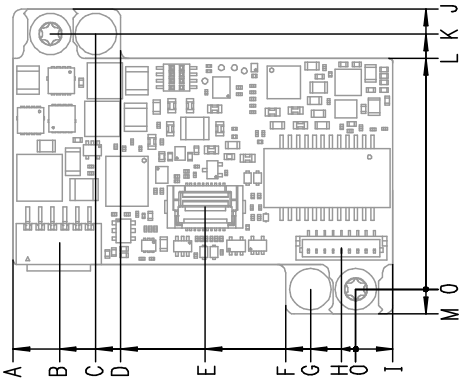


Fig. 7-7 FETK-S1.1 Dimensions - Top View

Item	**Dimension** [Millimeters]	Tolerance [Millimeters]	**Dimension** [Inches]	Tolerance [Inches]
A	41.50	+/- 0.20	1.634	+/- 0.008
B	35.90	+/- 0.30	1.413	+/- 0.012
C	31.50	+/- 0.10	1.240	+/- 0.004
D	28.50	+/- 0.20	1.122	+/- 0.008
E	18.25	+/- 0.30	0.719	+/- 0.012
F	8.50	+/- 0.20	0.335	+/- 0.008
G	5.50	+/- 0.10	0.217	+/- 0.004
H	1.75	+/- 0.20	0.069	+/- 0.008
I	4.50	+/- 0.20	0.177	+/- 0.008
J	34.00	+/- 0.20	1.339	+/- 0.008
K	31.00	+/- 0.10	1.220	+/- 0.004
L	28.00	+/- 0.20	1.102	+/- 0.008
M	3.00	+/- 0.20	0.118	+/- 0.008

7.11.2 Side View

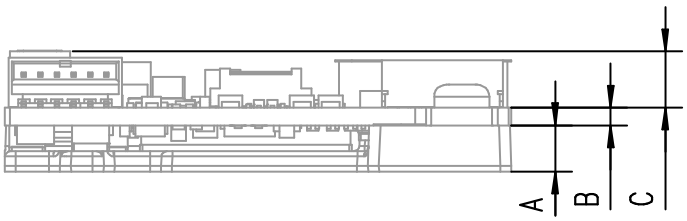


Fig. 7-8 FETK-S1.1 Dimensions - Side View

Item	**Dimension** [Millimeters]	Tolerance [Millimeters]	**Dimension** [Inches]	Tolerance [Inches]
A	4.20	+/- 0.10	0.165	+/- 0.004
B	1.60	+/- 0.16	0.063	+/- 0.006
C	5.10	+0.0/-0.2	0.201	+0.000/-0.008

8 Cables and Accessories

8.1 Overview and Classification

This chapter contains information about the following topics:

8.2 Requirements for failsafe Operation

NOTE

See chapter 5.2 on page 32 for details on wiring the ECU interface adapters.

NOTE

We recommend to use ETAS cables or any other cables certified by the standards for the application. Adhere to the maximum permissible cable lengths!

NOTE

Application-specific cables are available from ETAS. Please contact your ETAS contact partner or e-mail sales.de@etas.com.

8.3 CBAM300 Cable

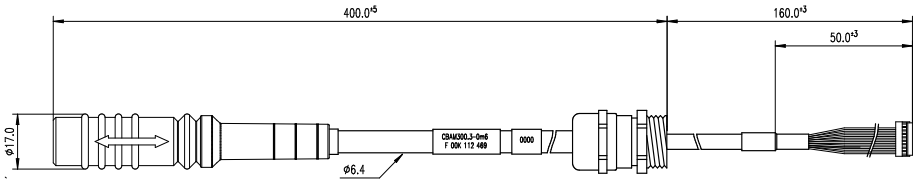


Fig. 8-1 CBAM300.3 Cable - Dimensions

8.3.1 Usage

The FETK ECU interface cable CBAM300.3 is pre-assembled into PG9 screwing, with a connected shield on screwing:

- For thin walled housings, use a through boring with 15.2 mm in the housing and mount the cable with a nut (not included) (SM-PE 9 order number 52103210 from Lapp).
- For wall thickness more than 4 mm cut a thread into the housing.

8.3.2 Connectors

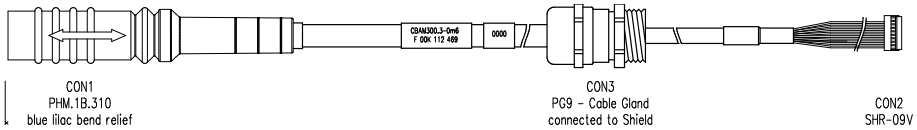


Fig. 8-2 CBAM300.3 Cable - Connectors

Connector	Color	Target
CON1	Blue lila	GBit Ethernet cable, e.g. CBE260
CON2	White	FETK
CON3	-	Shield ECU housing

8.3.3 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +125 °C

8.3.4 Tightness

Condition	IP Code
PG9 screwing	IP67

8.3.5 Ordering

Product	Length	Order Number
CBAM300.3-0m6	0.6 m	F 00K 112 469

8.4 CBAM320 Cable

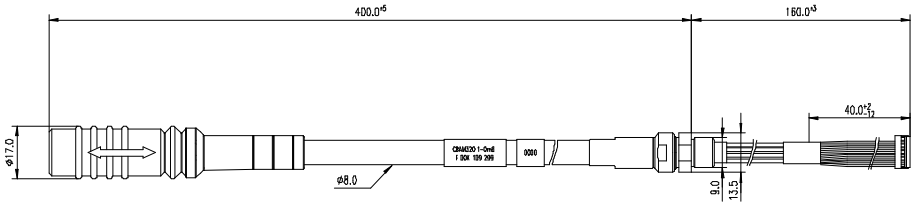


Fig. 8-3 CBAM320 Cable - Dimensions

8.4.1 Usage

The CBAM320.1-0m60 ETK interface cable is a 1 GBit/s cable adapter for FETKs. It is pre-assembled into M9 screwing, shield connected to the screwing:

- For wall thickness less than 4 mm, it is possible to use a through boring with 9.2 mm in the housing and mount the cable with a nut (included).
- For wall thickness more than 4 mm cut a thread into the housing. A special Lemo thread cutter is necessary.

8.4.2 Connectors

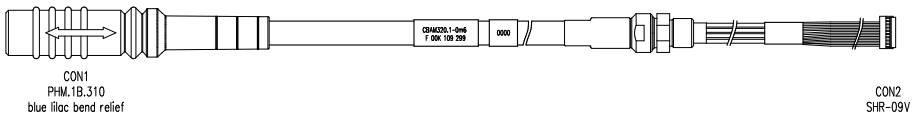


Fig. 8-4 CBAM320 Cable - Connectors

Connector	Color	Target
CON1	Blue lila	Gbit Ethernet cable, e.g. CBE260
CON2	White	FETK

8.4.3 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +125 °C

8.4.4 Tightness

Condition	IP Code
PG8 screwing	IP67

8.4.5 Ordering

Product	Length	Order Number
CBAM320.1-0m6	0.6 m	F 00K 109 299

8.5 CBAM340 Cable

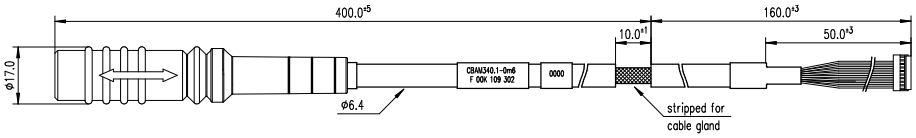


Fig. 8-5 CBAM340 Cable - Dimensions

8.5.1 Usage

The FETK interface cable CBAM340.1 is stripped for 10 mm, to mount the cable with a EMC safe cable gland into the ECU housing.

FETK ECU Adapter Cable, shield on ECU-Housing

> **NOTE**
>
> The hardware for mounting ECU adapter cables is not included in the cable delivery, they need to be ordered separately. For detailed information on mounting accessories contact ETAS technical support.

8.5.2 Connectors

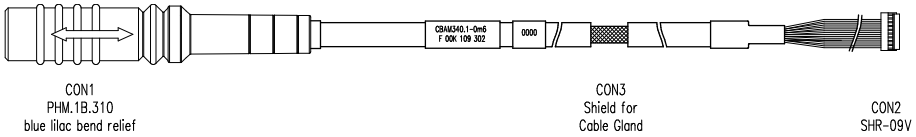


Fig. 8-6 CBAM340 Cable - Connectors

Connector	Color	Target
CON1	Blue lila	Gbit Ethernet cable, e.g. CBE260
CON2	White	FETK
CON3	-	Shield to ECU housing

8.5.3 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +125 °C

8.5.4 Ordering

Product	Length	Order Number
CBAM340.1-0m6	0.6 m	F 00K 109 302

8.6 CBAM350 Cable

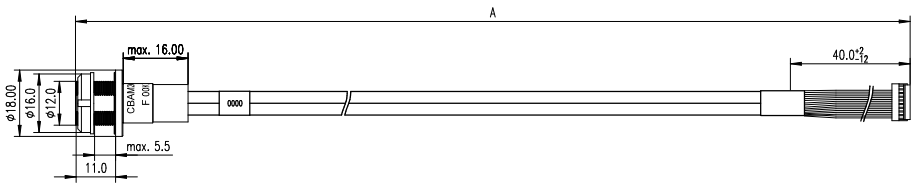


Fig. 8-7 CBAM350 Cable - Dimensions

8.6.1 Usage

The CBAM350.1-0 FETK interface cable is a 1 GBit/s cable adapter with a water tight socket. The cable shield is connected to socket. It is usable for ECUs with shielded housing.

8.6.2 Panel Cut-Out

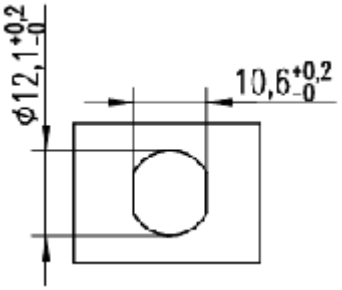
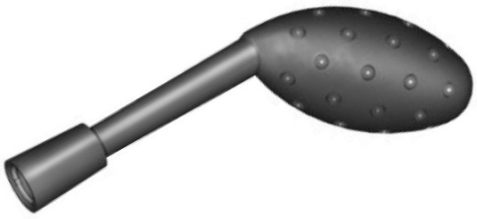


Fig. 8-8 Dimension Panel Cut-Out

8.6.3 Assembling



A Lemo tool, type “Lemo Spanner DCH.91.161.PA” is needed for assembling the connector (not included in the delivery).

NOTE

The Lemo Spanner DCH.91.161.PA is not included in the cable delivery, It need to be ordered separately. For detailed information on mounting accessories contact ETAS technical support.

8.6.4 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +125 °C

8.6.5 Ordering

Product	Length	Order Number
CBAM350.1-0m17	0.17 m	F 00K 111 439

8.7 CBAM305 Cable

8.7.1 Usage

The CBAM305.1 FETK cable is a 1 GBit/s Ethernet cable adapter with external power supply for FETKs.

Pre-assembled into PG9 screwing, shield connected to the screwing. It is usable for ECUs without permanent power supply inside. Depending on the version, there is a power plug on the ECU side or an open cable end on the power cable:

- For thin walled housings, use a through boring with 15.2 mm in the housing and mount the cable with a nut (not included) (SM-PE 9 Order number 52103210 from Lapp).
- For wall thickness more than 4mm cut a thread into the housing.

If the CBAM305.1-2m2 is used, a 2 pin Erni connector (214011 or compatible) must be available on the ECU as counterpart for the UBatt connector.

NOTE

It is recommended for safety reasons to connect the external permanent voltage and the switched voltage inside the ECU!

NOTE

For mounting the cable, cut a PG9 thread into the ECU housing. For thin walled housings use a nut SM-PE 9. It is available from Lapp (order number: 52103210).

8.7.2 Dimensions

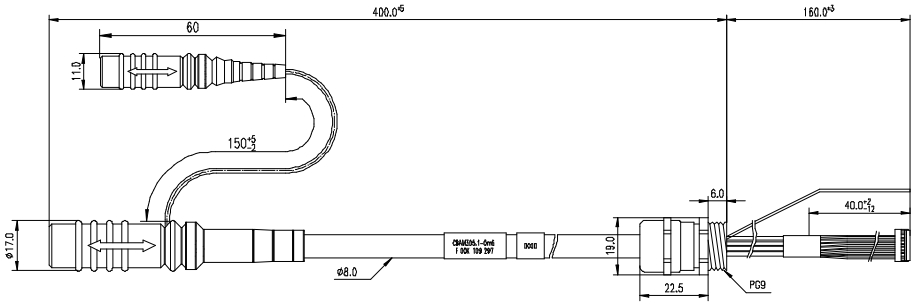


Fig. 8-9 CBAM305.1-0m6 Cable - Dimensions

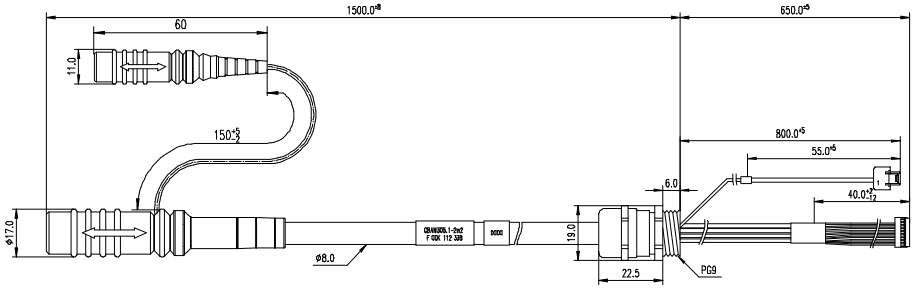


Fig. 8-10 CBAM305.1-2m2 Cable - Dimensions

8.7.3 Connectors

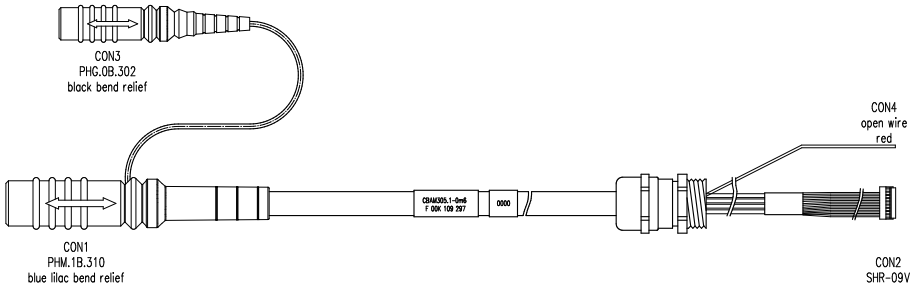
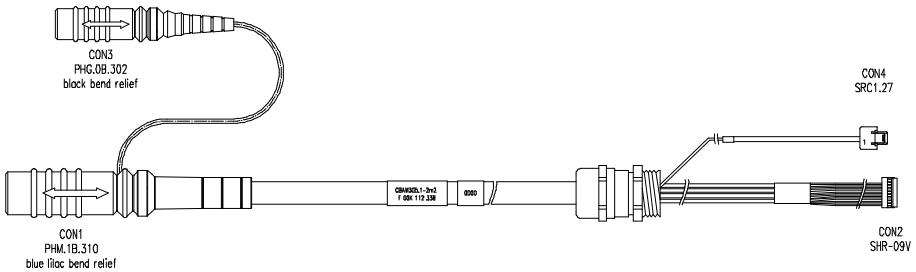


Fig. 8-11 CBAM305.1-0m6 - Connectors

Connector	Color	Target
CON1	Blue lila	Gbit Ethernet cable, e.g. CBE260
CON2	White	FETK
CON3	Black	Permanent power supply, K70.1 cable
CON4	Red	FETK UBATT



Connector	Color	Target
CON1	Blue lila	Gbit Ethernet cable, e.g. CBE260
CON2	White	FETK
CON3	Black	Permanent power supply, K70.1 cable
CON4	Red	2 pin ERNI power ECU connector

Fig. 8-12 CBAM305.1-2m2 - Connectors

8.7.4 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +125 °C

8.7.5 Tightness

Condition	IP Code
PG9 screwing	IP67

8.7.6 Ordering

Product	Length	Order Number
CBAM305.1-0m6	0.6 m	F 00K 109 297
CBAM305.1-2m2	2.2 m	F 00K 112 338

8.8 CBE260 Cable

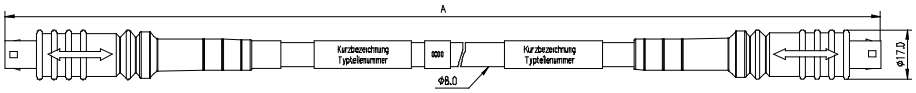


Fig. 8-13 CBE260 Cable

8.8.1 Usage

Gigabit Ethernet and Power Connection cable for FETK. Lemo connectors on both sides compliant to IP65. 3 m length.

The CBAE260 cable is a Gigabit Ethernet cable to connect an ETAS ES device with an FETK or another ES device. The cable supports power propagation.

8.8.2 Dimensions

Short Name	Length A
CBE260.1-3	300 cm
CBE260.1-5	500 cm
CBE260.1-8	800 cm

8.8.3 Connectors

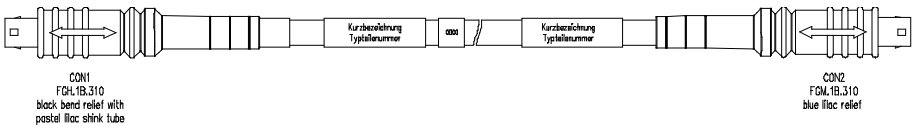


Fig. 8-14 CBE260 - Connectors

Connector	Color	Target
CON1	Pastel lila	ES8xx Downlink
CON2	Blue lila	ES8xx Uplink, FETK

8.8.4 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +120 °C

8.8.5 Ordering

Product	Length	Order Number
CBE260.1-3	3 m	F 00K 109 446
CBE260.1-5	5 m	F 00K 111 001
CBE260.1-8	8 m	F 00K 109 447

8.9 ETAM8 Adapter

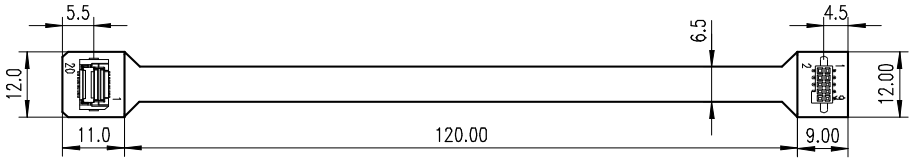


Fig. 8-15 ECU Adapter ETAM8 (bottom view)

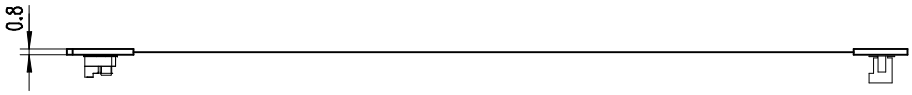


Fig. 8-16 ECU Adapter ETAM8 (side view)

8.9.1 Usage

The ETAM8 ECU adapter connects the ECU via a 10 pin SAMTEC TFM-105 connector to a BR_XETK-S, FETK-S or FETK-T.

There are two variants for the ETAM8 adapter available:

- ETAM8A hold the ECU in Reset, while the ETK is booting.
- ETAM8B do not pull the Reset low while booting.

  With a ETAM8B adapter the FETK-S1.1 has the same reset behavior like FETK-T1.0.

NOTE

See chapter "Installation" for details on mating connector to the ETAM8.

8.9.2 Pin Numbering

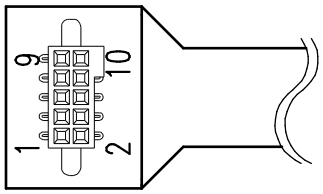


Fig. 8-17 ECU Adapter ETAM8 (pin numbering)

8.9.3 ECU Connector: Signal Modes

Pin Number	JTAG Mode	LFAST Mode	DAP Mode
1	GND	GND	GND
2	TCK	DRCLK	DAP0
3	/TRST	RXD-	/TRST
4	TDO	RXD+	DAP2
5	TMS	TXD+	DAP1
6	TDI	TXD-	-
7	WDGDIS	WDGDIS	WDGDIS
8	VDD (Sense)	VDD (Sense)	VDD (Sense)
9	/RESETOUT	/RESETOUT	/RESETOUT
10	/PORESET	/PORESET	/PORESET

8.9.4 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +110 °C

8.9.5 Ordering

Product	Length	Order Number
ETAM8A	0.11 m	F 00K 110 754
ETAM8B	0.11 m	F 00K 110 881

8.10 ETV5 Cable

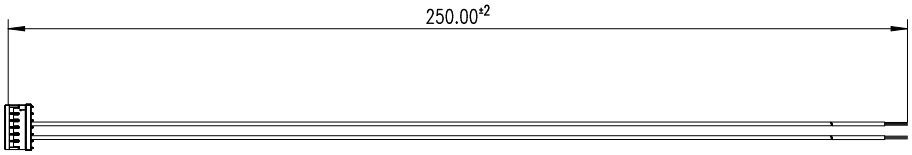


Fig. 8-18 Power Supply Cable ETV5

8.10.1 Usage

The ETV5 cable is an open wire power supply cable with one battery and GND connection.

NOTE

For better power integrity cut the cable to the shortest possible length.

8.10.2 Pin Assignment

Pin Number	Color	Signal	Description
1			Not connected
2			Not connected
3	Brown	GND	Power GND
4			Not connected
5	Red	SGUBATT1	Car Battery
6			Not connected

8.10.3 Temperature Range

Condition	Temperature
Operating temperature	-40 °C to +110 °C

8.10.4 Ordering

Product	Length	Order Number
ETV5	0.25 m	F 00K 111 701

8.11 ETAM2 Adapter

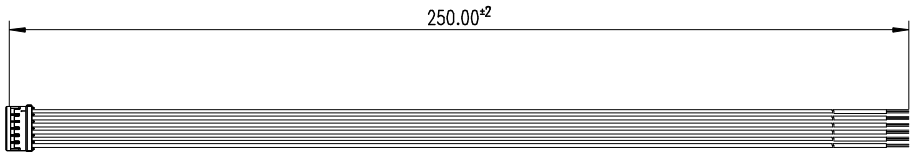


Fig. 8-19 FETK - ECU Adapter ETAM2

NOTE

See chapter "Installation" for details on mating connector to the ETAM2.

8.11.1 Pin Assignment

Fig. 8-20 ETAM2 Connector

8.11.2 ECU Signals

Pin	Color	Signal	Description
1	Blue	VDDPSTBY (Supply)	Permanent power to supply ECU interface (optional)
2	Yellow	VDDSTBY (Supply)	Permanent power to supply ECU ED-RAM
3	Brown	GND	Power ground
4	Green	CAL_Wakeup	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Red	SGUBATT2	Car battery
6	Red	SGUBATT1	Car battery

8.11.3 Ordering

Product	Length	Order Number
ETAM2	0.25 m	F 00K 109 306

8.12 ETAM5 Adapter

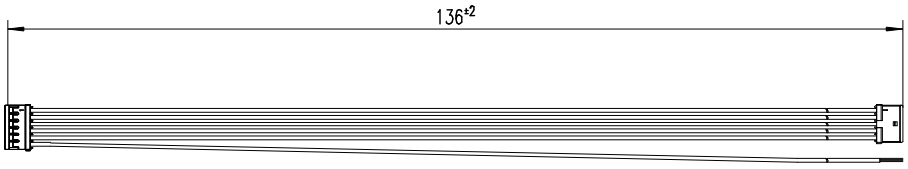


Fig. 8-21 FETK - ECU Adapter ETAM5

NOTE

See chapter "Installation" for details on mating connector to the ETAM5.

8.12.1 Pin Assignment

Molex Side A	Wire: Medi cable	5 mm stripped and tinned Side B	Molex Side C
Position	Color	Position	Position
1	Blue		1
2	Yellow		2
3	Brown		3
4	Green		4
5	Red		5
6	Red		

8.12.2 Ordering

Product	Length	Order Number
ETAM5	0.136 m	F 00K 110 101

8.13 ETAM9 Adapter

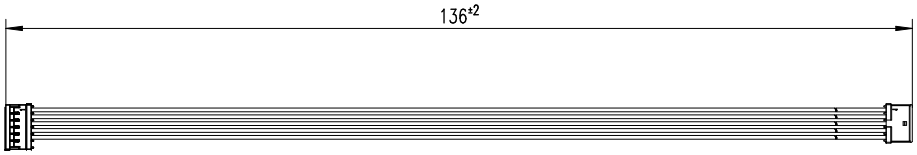


Fig. 8-22 FETK/ XETK - ECU Adapter ETAM9

8.13.1 Usage

The ETAM9 adapts the FETK/ XETK power signals (Molex 6 pin connector) to the ECU with an 5 pin Molex Pico Spox connector.

The ETAM9 cable requires on the ECU side an Vertical SMT Header connector [87437-0543] or an Right Angle SMT Header connector [87438-0543].

8.13.2 ECU Signals

Pin	Color	Signal	Description
1	Blue	VDDPSTBY (Supply)	Permanent power supply of ECU interface
2	Yellow	VDDSTBY (Supply)	Permanent power supply of ECU ED RAM
3	Brown	GND	Power ground
4	Green	Cal_Wakeup	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Red	SGUBATT1	Car battery
6	-	-	No Connect

8.13.3 Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +110 °C

8.13.4 Order Information

Product	Length	Order Number
ETAM9 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 5fc), 0m136	0.136 m	F 00K-111-043

8.14 ETAM10 Adapter

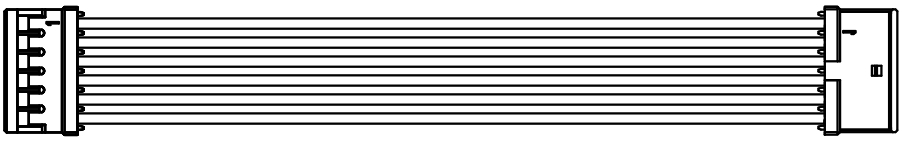


Fig. 8-23 FETK/ XETK - ECU Adapter ETAM10

MOLEX - MOLEX (6fc - 6fc) adapter cable for connecting an FETK or XETK to the ECU.

8.14.1 Usage

ETAM10 adapts the ETK power signals (Molex 6 pin connector) to an ECU with a 6 pin Molex PicoSpox connector.

The ECU connector is available as Vertical SMT Header [87437-0643] or Right Angle SMT Header [87438-0643].

8.14.2 Dimensions

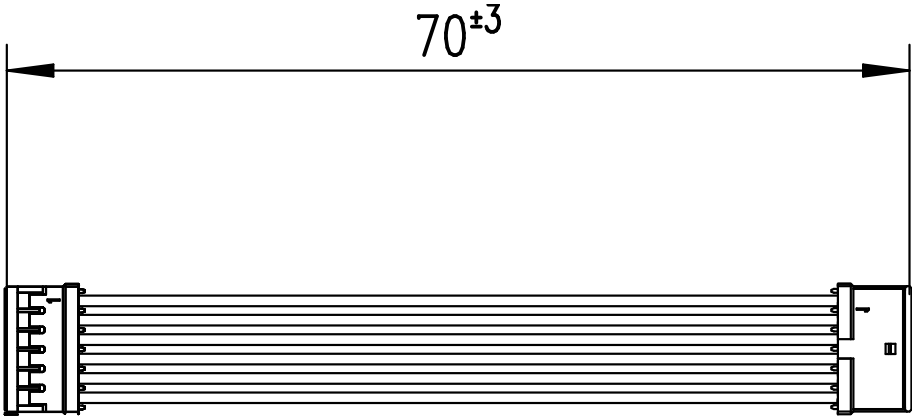


Fig. 8-24 ETAM10 Adapter Dimensions

8.14.3 ECU Signals

Pin	Color	Signal	Description
1	Blue	VDDPSTBY (Supply)	Permanent power supply of ECU interface
2	Yellow	VDDSTBY (Supply)	Permanent power supply of ECU ED RAM
3	Brown	Ground	Power ground
4	Green	Cal_Wakeup	Switch to Ubatt. ECU wake-up signal (for measurement preparation)
5	Red	SGUBATT2	Car battery
6	Red	SGUBATT1	Car battery

8.14.4 Temperature Range

Condition	Temperature Range
Operating temperature	-40 °C to +110 °C

8.14.5 Order Information

Product	Length	Order Number
ETAM10 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 6fc), 0m07	0.07 m	F 00K-111-814

9 Ordering Information

9.1 FETK-S1.1

Order Name	Short Name	Order Number
FETK-S1.1A Emulator Probe for the Infineon AURIX microprocessor family	FETK-S1.1A	F 00K 111 101

Package Contents

- FETK-S1.1A Emulator Probe for the Infineon AURIX microprocessor family
- List "Content of this Package"
- ETK Safety Advice
- China-RoHS-leaflet_Compact_cn

9.2 FETK-S1.1B

Order Name	Short Name	Order Number
FETK-S1.1B Emulator Probe for the Infineon AURIX microprocessor family	FETK-S1.1B	F 00K 111 264

Package Contents

- FETK-S1.1B Emulator Probe for the Infineon AURIX microprocessor family
- List "Content of this Package"
- ETK Safety Advice
- China-RoHS-leaflet_Compact_cn

9.3 Cable

NOTE

We recommend to use ETAS cables or any other cables certified by the standards for the application. Adhere to the maximum permissible cable lengths!

Please contact your local ETAS representative for further cable information.

NOTE

The cables shown in chapter “Cables and Accessories” on page 50 are not included in the FETK-T1.1 delivery.

9.3.1 ECU Adapter Cable

NOTE

The hardware for mounting ECU adapter cable CBAM240.1 is not included in the cable delivery, they need to be ordered separately. For detailed information on mounting accessories contact ETAS technical support.

Order Name	Short Name	Order Number
FETK ECU Adapter Cable, pre-assembled into PG9 screwing, shield on ECU- Housing, Lemo 1B PHM - JST SHR (10fc-9fc), 0m60	CBAM300.3-0m6	F 00K 112 469
FETK ECU Adapter Cable, pre-assembled into GSC.1S screwing (M9x0,6), shield on ECU-Housing, Lemo 1B PHM - JST SHR (10mc-9fc), 0m60	CBAM320.1-0m6	F 00K 109 299
FETK ECU Adapter Cable, shield on ECU-Housing, Lemo 1B PHM - JST SHR (10fc-9fc), 0m60	CBAM340.1-0m6	F 00K 109 302
FETK adapter cable, 1 Gbit/s, shield is connected to ECU, Lemo 1B HMM - JST SHR (10mc-9fc), 0m17	CBAM350.1-0m17	F 00K 111 439

9.3.2 ECU Adapter and Power Supply Cable

Order Name	Short Name	Order Number
FETK ECU Adapter and Power Supply Cable, pre-assembled into PG9 screwing, shield on ECU-Housing, Lemo 1B PHM - JST SHR (10fc-9fc) / Lemo 0B PHG - open wire (2fc-1c), 0m60	CBAM305.1-0m6	F 00K 109 297
FETK ECU Adapter and Power Supply Cable, pre-assembled into PG9 screwing, shield on ECU-Housing, Lemo 1B PHM - JST SHR (10fc-9fc) / Lemo 0B PHG - open wire (2fc-1c), 2m2	CBAM305.1-2m2	F 00K 112 338

9.3.3 GBit Ethernet and Power Supply Cable

Order Name	Short Name	Order Number
GBit Ethernet and Power Connection Cable for FETK, Lemo 1B FGM - Lemo 1B FGH (10fc-10mc), 3 m	CBE260.1-3	F 00K 109 446
GBit Ethernet and Power Connection Cable for FETK, Lemo 1B FGM - Lemo 1B FGH (10fc-10mc), 5 m	CBE260.1-5	F 00K 111 001
GBit Ethernet and Power Connection Cable for FETK, Lemo 1B FGM - Lemo 1B FGH (10fc-10mc), 8 m	CBE260.1-8	F 00K 109 447

9.3.4 ECU Adapter

Order Name	Short Name	Order Number
ETAM8A BR_XETK-S3 ECU Adapter, FCI - SAMTEC SFM (20c - 10fc), 0m11	ETAM8A	F 00K 110 754
ETAM8B BR_XETK-S3 ECU Adapter, FCI - SAMTEC SFM (20c - 10fc), 0m11	ETAM8B	F 00K 110 881

9.3.5 Power Supply Cable

Order Name	Short Name	Order Number
ETV5 F/XETK-S ECU Adapter, MOLEX - open wires (6fc - 2c), 0m25	ETV5	F00K 111 701
ETAM2 XETK/FETK ECU Adapter, MOLEX - open wires (6fc - 6c), 0m25	ETAM2	F 00K 109 306
ETAM5 FETK ECU Adapter, MOLEX - MOLEX (6fc - 5fc+1c), 0m136	ETAM5	F 00K 110 101
ETAM9 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 5fc), 0m136	ETAM9	F00K 111 043
ETAM10 F/XETK-S ECU Adapter, MOLEX - MOLEX (6fc - 6fc), 0m07	ETAM10	F00K 111 814

9.4 Power Supply

For special applications ETAS can offer a isolated power supply unit. For detailed information contact ETAS technical support.

10 Contact Information

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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:

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ETAS technical support	Internet:	www.etas.com/en/hotlines.php

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