ETKP9.0
Emulator Probe for Freescale MPC561, MPC562, MPC563 and MPC564

Data Sheet

Copyright

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Contents

1 General Information

The introductory chapter provides you with information on the basic safety instructions, returning the product and recycling, and how to use this manual.

1.1 Basic Safety Instructions

Please adhere to the following safety instructions to avoid injury to yourself and others as well as damage to the device.

1.1.1 Product liability

This manual addresses qualified personnel working in the fields of automobile control unit development and calibration. Specialized knowledge in the areas of measurement and control unit technology is required.

WARNING!

Integrating this module in your system changes the application system's response!
If an error or unexpected operation results occur, the response of your application system can be critical!
Only use the module in application systems equipped with additional safety or redundant systems (e.g. an emergency or backup system)!

Liability cannot be accepted for damage caused by non adherence to the instructions contained in this document!

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.

1.1.2 Correct Use

ETAS GmbH cannot be made liable for damage which is caused by incorrect use and not adhering to the safety instructions.

1.1.3 Labeling of Safety Instructions

The safety instructions contained in this manual are shown with the standard safety symbol shown in Fig. 1-1.

Fig. 1-1 Standard Safety Symbol

The following safety instructions are used. They provide extremely important information. Please read this information carefully.

WARNING!

Indicates a possible medium-risk danger which could lead to serious or even fatal injuries if not avoided.

CAUTION!

Indicates a low-risk danger which could result in minor or less serious injury or damage if not avoided.

1.2 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. 1-2 WEEE Symbol

The WEEE symbol (see Fig. 1-2 on page 8) 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 Program, contact the ETAS sales and service locations (see chapter 9 on page 51).

1.3 About This Manual

This manual describes the startup and technical data of the ETKP9.0 Emulator Test Probe.

1.3.1 Structure

This manual consists of eight chapters and an index.

- **Chapter 1: “General Information”**

  The “General Information” (this chapter) provides you with information on the basic safety instructions, returning the product and recycling, and how to use this manual.

- **Chapter 2: "Introduction"**

  The chapter "Introduction" contains information about the basic features and applications of the ETKP9.0 Interface Board (ETK = Emulator Test Probe), hints to system requirements for operating the ETKP9.0, and other details.

- **Chapter 3: “Hardware Description”**

  In the "Hardware Description" chapter the function blocks and the interfaces of the ETKP9.0 are explained in detail.

- **Chapter 4: “Installation”**

  The “Installation” chapter describes the hardware installation of the ETKP9.0.

- **Chapter 5: “ETK Configuration”**

  The “ETK Configuration” chapter includes a description of important ETKP9.0 configuration parameters.

- **Chapter 6: “Technical Data”**

  The “Technical Data” chapter contains a summary of all technical data and pin assignments of the ETKP9.0.

- **Chapter 7: “Cables and Accessories”**

  The “Cables and Accessories” chapter contains an overview of the available cables and accessories.

- **Chapter 8: “Ordering Information”**

  The “Ordering Information” chapter contains the ordering information on the available cables and accessories.

The final chapter, “ETAS Contacts”, gives you information on ETAS’ international sales and service locations.

1.3.2 Using this Manual

Typographic Conventions

The following typographic conventions are used:

Bold	Device labels
Italics	Crucial text

Important notes for the user are shown as follows:

Note

Important note for the user.

2 Introduction

This section contains information about the basic features and applications of the ETKP9.0 ETK Interface Board (ETK = Emulator Test Probe), hints to system requirements for operating the ETKP9.0, and other details.

2.1 Applications

The ETKP9.0 is an emulator probe especially for the Freescale microcontrollers MPC561/MPC562 and MPC563/MPC564. It is a typical parallel ETK with a 32 bit interface. The ECU's crystal is used for the microcontroller clock frequency.

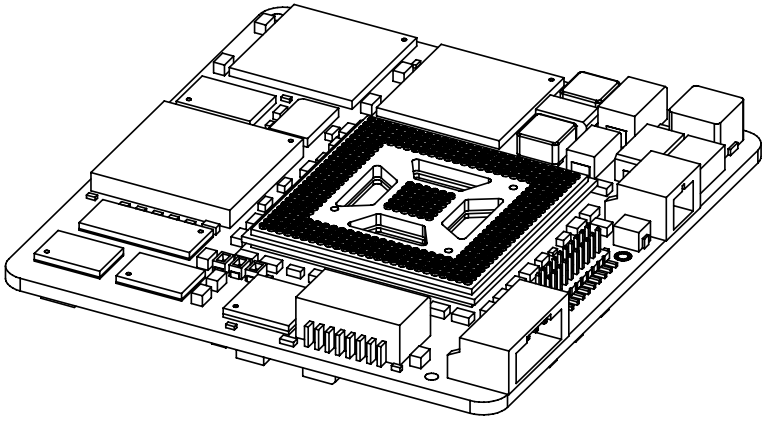


Fig. 2-1 ETKP9.0

It is compatible with the new ETAS calibration and development system interface (e.g. ES690, ES590, ES591 and ES1000.2/ES1000.3 with ES1232-A). Earlier systems (e.g. MAC2, ES1000.1 with ES1201 board) are not supported.

2.2 Features

- Applicable for an external Freescale 32-bit microcontroller bus
- Supports 32-, 16- and 8-bit access to the data emulation memory
- CPU bus interface voltage 2.5 V (3.3 V tolerant)
- Two pages of data emulation/measurement data memory available, each with 1 MByte
- Permanent storage of emulation data in flash memory
- Can generate the "Hard reset configuration" to configure the CPU

- ECU flashing via ETK possible
- Configurable chip select for ETK
- Enable or disable the ETK by ECU software possible
- Braindead flashing under ProF control possible
- Serial interface with 100 MBit/s to the calibration and development system
- Permanent storage of configuration in E²PROM
- Firmware update (programming of the logic device) through software; removal of ETK or ECU not necessary
- Power supply: 4.3 V to 18 V DC
- Temperature range: -40 °C to +110 °C / -40 °F to +230 °F
- Dimensions (H x W x D): ca. 9.9 mm x 61 mm x 64 mm/ 0.39 inch x 2.40 inch x 2.52 inch

2.3 Supported Controller

Type	Supported Controller
ETKP9.0-B	Freescale MPC563 and MPC564 series microcontroller
ETKP9.0-K	Freescale MPC561, MPC562, MPC563, MPC564 series microcontroller

2.4 System Requirements

This section tells you which hardware and software are needed to operate your ETKP9.0.

Note

Carefully check the software version numbers and cable names. Wrong software versions and cables could impair the proper functioning of your ETKP9.0 damage the ETKP9.0 and the connected devices.

2.4.1 Hardware

Required ETAS Hardware

VME Hardware: ES1000.2/ES1000.3 with ES1120 and ES1232

Compact Hardware: ES690 and ES59x

Not supported ETAS Hardware

MAC2

ES1000.1 with ES1111 and ES1200/ES1201

ES1000.2/ES1000.3 with ES1120 and ES1200/ES1201

ES1000.2/ES1000.3 with ES1120 and ES1231

2.4.2 Software Support

You need following software versions to support the ETKP9.0:

Software	Version (or higher)
HSP (Firmware)	4.0
INCA	5.2
ASCET-RP	5.1
INTECRIO	1.0

3 Hardware Description

In this chapter, the function blocks of the ETKP9.0 are explained in detail.

3.1 Architecture

Fig. 3-1 "ETKP9.0 Architecture" shows the blockdiagram of the ETKP9.0. The connection to the ECU is made by a BGA connector.

The processor can read directly from one of the two pages of the data emulation memory and can write its data directly to the measurement data memory. These two memories (data emulation memory, measurement data memory) are using the same address space and are realized inside the same DPRs.

Through the BGA connector the processor can communicate with other external memories or peripheral components too. All processor signals are accessible on the BGA connector.

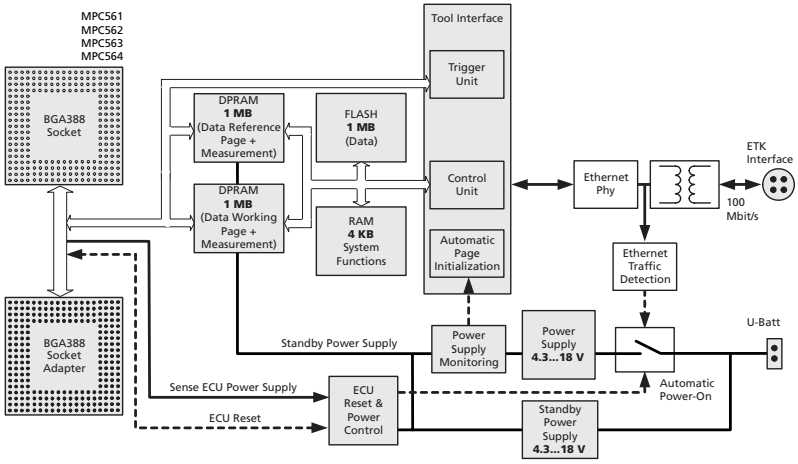


Fig. 3-1 ETKP9.0 Architecture

While the processor accesses the program data (not the program code) out of the data emulation memory, the content of the data emulation 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 processor can send data to the calibration and development system which receives, buffers and processes this measured data.

A flash memory is available for permanent storage of the adjusted parameters (program data).

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

The ETKP9.0 uses a 3 V technology. The power supply for the ETKP9.0 is provided by a switch mode power supply, to minimize power dissipation.

3.2 Processor Interface

The whole processor interface to the calibration and development system memories has a 32 bit wide data bus and uses only one chip select for read and write accesses.

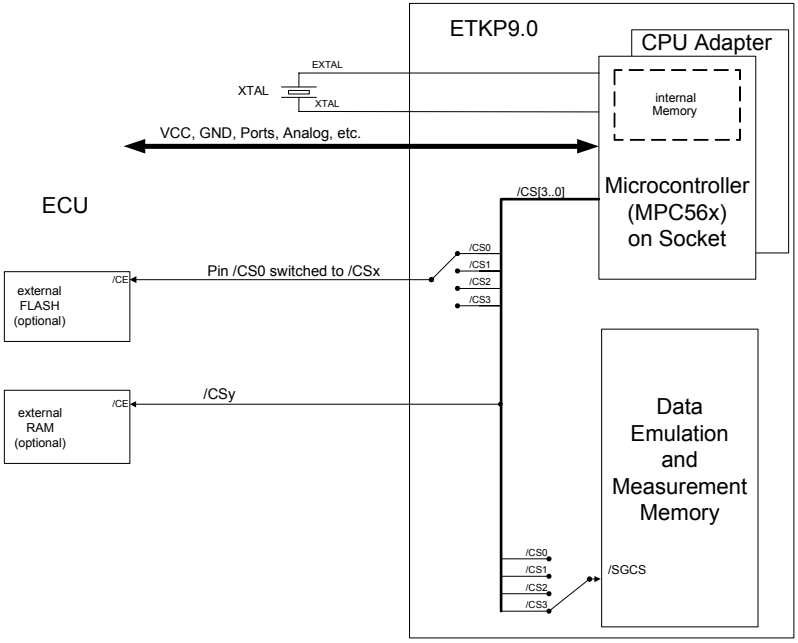


Fig. 3-2 System with internal and external Memory

The processor can read and write its data directly from or to the data emulation and measurement data memory. Fig. 3-2 "System with internal and external Memory" shows an overview of the system with "on chip" Flash and RAM and external Flash and RAM memory. It also shows the possibilities to access the different memories with its chip selects. The chip select of the data emulation and measurement data memory can be choosen from (/CS0, /CS1, /CS2, /CS3) with the "ETK Configuration Tool" (see chapter 5 "ETK Configuration"). For purpose of braindead flashing the ECU /CS0 can be assigned to one of the microcontroller chip select signals (/CS0, /CS1, /CS2, /CS3).

3.3 BGA Connector

The BGA connector interfaces the processor with the ECU. All signals of the processor are directly connected to the BGA connector with the exeption of /CS0 (see chapter 3.2 "Processor Interface"). Also the clock signal must be provided through the connector to the MPC561/MPC562 or the MPC563/MPC564.

3.4 Data Emulation and Measurement Data Memory

The complete data emulation and measurement data memory consists of two 1 MByte pages (Fig. 3-3 "Data Emulation and Measurement Data Memory: 2 Pages with 1 MByte each"). The address range of the used chip select to address the data emulation and measurement memory must be 1 MByte and it must be defined at a 1 MByte boundary.

Data emulation memory and measurement data memory must be located inside this 1 MByte address range. The segmentation of this address range between both memory parts is variable.

So the measurement data memory and data emulation memory can have variable size and offset addresses inside this fixed address range.

3.4.1 Data Emulation Memory

During operation of an ECU, only program data, not program code, can be modified by using the data emulation memory. Modification of program code would inevitably lead to a system crash. The program code is continuously processed out of the internal or external memory.

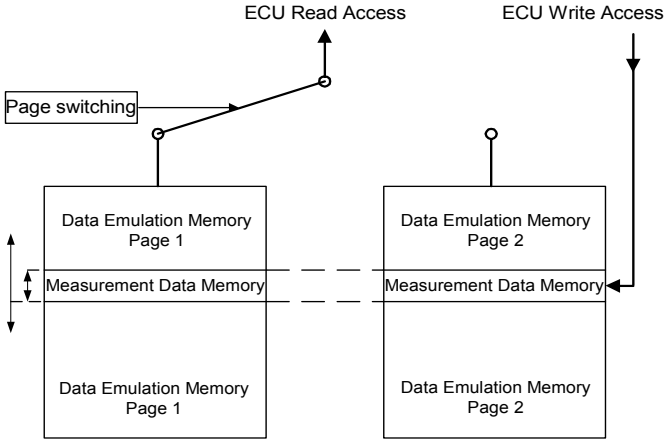


Fig. 3-3 Data Emulation and Measurement Data Memory: 2 Pages with 1 MByte each

Reference data can be stored on one page ("Reference page") while the data on the other page ("Working page") can be modified. It is possible to switch between the two pages during operation through the application software.

3.4.2 Measurement Data Memory

The measurement data memory must be located within the address space of the data emulation and measurement data memory. It can have variable size.

The measured data stored here can be transferred to the calibration and development system via the serial ETK interface.

Note

Because there is no write protection of the data emulation memory possible, it must be taken care not to override emulation data.

3.4.3 Triggering of Measurement Data Acquisition

The exact procedure for capturing measured data is explained in the documentation Display Tables 12 and 13; only the hardware-specific features are mentioned here. The ECU microcontroller initiates a data acquisition task by writing on the trigger address at the so called trigger segment. The software of the ECU is able to start differnet data acquisition tasks by writing different trigger addresses (trigger 0 to trigger 31).

The ETKP9.0 contains a trigger comparator which selects a segment of 256 Byte out of the measurement data memory address space (at a 256 Byte limit). This limit is known as the trigger segment address. Fig. 3-4 "Division of the 256 Byte Trigger Segment" shows the configuration of the 256 Byte trigger segment.

The ETKP9.0 supports up to 32 direct hardware triggers by providing 32 trigger addresses within the trigger segment.

Note

The unused address areas within the trigger segment are reserved for future applications and must not be used for other purposes.

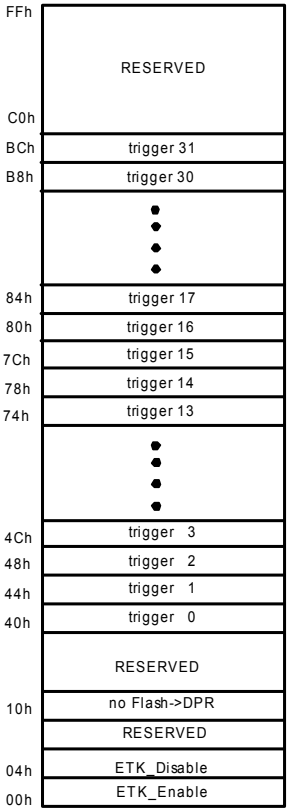


Fig. 3-4 Division of the 256 Byte Trigger Segment

3.4.4 Data Retention in Data Emulation Memory

The data emulation and measurement data memory physically consists of a static Dual Port RAM and is permanently supplied with power from the car battery, to guarantee that data is preserved even when the ignition is switched off. If the ECU with ETK is isolated from the battery, all data will be lost. For brief power interruptions, e.g. during a cold start procedure, buffering is guaranteed through capacitors for several milliseconds.

3.5 Data Flash Memory

Flash memory is provided on the ETKP9.0 for permanent storage of emulation data. Users can copy the contents of the data emulation and measurement data memory into the flash memory using the operating software. It is recommended that an updated data set is always stored in the flash memory.

The ETKP9.0 has a circuit which recognizes and stores power failures. If this circuit detects a longer power failure, and therefore a possible inconsistency of the emulation data, the ETK controller initiates a copying procedure Flash memory to DPR upon restart. The Flash memory data is copied to both emulation pages. A green LED on the ETK displays the procedure. The operating software announces the procedure by a message in the status line.

If the ETKP9.0 is used as a normal RAM it may be useful that this copying procedure is switched off. This can be done by doing a write cycle to a dedicated address in the trigger segment (trigger segment address + 0x010h, see Fig. 3-4 "Division of the 256 Byte Trigger Segment"). The green LED on the ETK will be switched off.

Note

The Flash memory on the ETKP9.0 only stores data which exists in the data emulation and measurement data memory of the ETKP9.0. The program code is stored only in the ECU Flash memory.

3.6 Code Flash Memory

The program code is not emulated by the ETKP9.0. The program code is stored in the ECU Flash memory ("on chip" and/or external) and is not modified by the ETKP9.0. Only the accessible emulation data areas are emulated by the ETKP9.0. The ECU Flash memory can be programmed with the normal Flash memory programming tools.

3.7 ETK Configuration

As already mentioned in previous chapters, some project-specific adjustments are necessary. Configuration data is stored permanently in a serial E²PROM. Generating a valid configuration data set is supported by the "ETK Configuration Tool". The "ETK Configuration Tool" contains information on all available ETKs. The user is supported through a graphical interface.

The "ETK Configuration Tool" can create the following output:

1. Direct ETK configuration
2. Storage of the configuration in a data file.

3.8 Power Supply

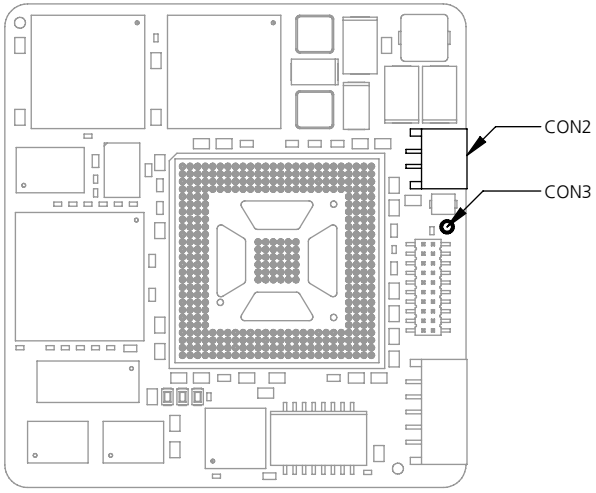


Fig. 3-5 Power Supply Connectors

The ETKP9.0 needs a permanent power supply. It is powered directly from the car battery. The input voltage may vary between 4.3 V and 18 V.

The ECU voltage (U_{SG}) is monitored by the ETK to recognize whether the ECU is switched on or off. 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 heat build-up. The power supply of the ECU is not affected by the ETKP9.0. An automatic switch ensures that the power supply of the ETKP9.0 is automatically switched on and off.

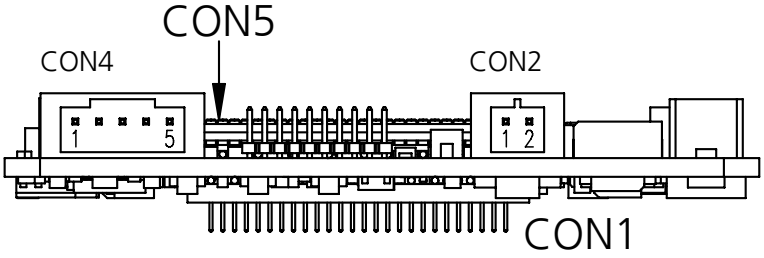


Fig. 3-6 Power Supply Connector CON2

The ETKP9.0 can be supplied with power through the 2-pin power supply connector CON2.

Additionally the through-hole solder pad CON3 can be used to connect a power supply U_{Batt2}. The power supply on CON3 must use the GND of CON2.

Pin CON2	Signal	Description
1	U_{Batt1}	Battery Supply Voltage for ETK
2	GND	Ground

3.9 Serial ETK Interface

The serial 100 MBit/s ETKP9.0 interface creates the link to the calibration and development system. The ES1232-A plug-in board for the ES1000 high-end system and the ES690 will support the 100 Mbit/s interface.

The interface utilizes a 100Base-TX transmission to achieve an outstanding transmission performance of 100 MBit/s. This interface requires a double-shielded twisted-pair cable (maximum length: 30 m).

It is not possible to use the old interface cable (for 8 MBit/s) with the new interface in the 100 MBit/s mode.

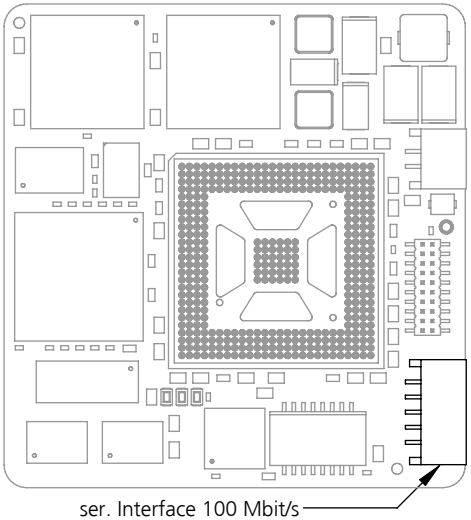


Fig. 3-7 Location of the Serial ETK Interface

3.10 Status LEDs

There are three LEDs displaying the operating status of the ETKP9.0 (Fig. 3-8 on page 23). Every LED has a seperat function, there is no additional information about ETKP9.0 by observing the LEDs in combinations..

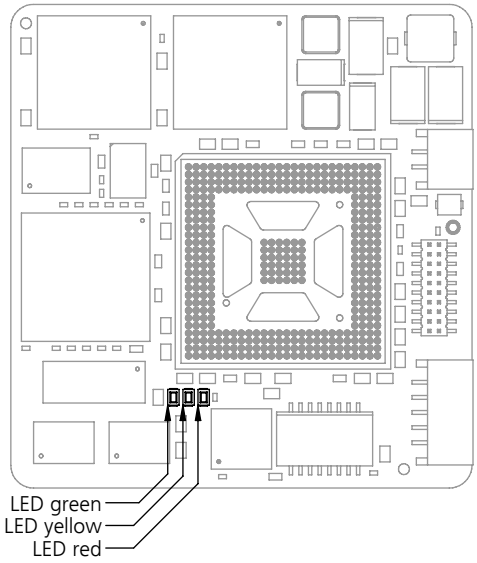


Fig. 3-8 Status LEDs

LED	State	Meaning
Red	On	ETKP9.0 is supplied with power and either the ECU and/or the compatible ETAS calibration and development system is connected and ready to communicate with the ETKP9.0

LED	State	Meaning
Green	Off	Working page and reference page could be different to the ETK-Flash Working page could be different to reference page
	Flashing	ETK is not in its normal operation mode, i.e. measurement and calibration are not possible (in all "ETK usage as" modes except "ETK mode initialized")
	On	Power supply decline under 3.5 V: - data retention of the DPRs is no longer ensured - as soon as the ETKP9.0 switches on again, the content of the Flash will be copied into the RAMs - until the calibration and development system copies new data into the RAMs
Yellow	Off	ETKP9.0 communicates with calibration system at 8 Mbit/s
	On	ETKP9.0 communicates with calibration system at 100 Mbit/s

3.11 Braindead Flashing

In order to support braindead flashing the ETKP9.0 provides the hardware prerequisites to allow booting the ECU from the ETK memory and making the flash accessible to the software while the ECU is running from the ETK memory. For braindead flashing it is required that the microcontroller boots from the ETK memory. The following description assumes that the ETK is by default connected to /CS2 and the ECU flash is tied to the /CS0 line, but any other configuration will work either in a similar way.

When braindead flashing is initiated, the first step is to force the ECU into a reset. During reset the ETKP9.0 is configured to be accessed by the /CS0 line and the ECU flash is connected via a multiplexer to /CS2. In addition the EPEE pin will be driven high by the ETK thus enabling ECU flash programming and a valid boot programming code will be downloaded into the ETKP9.0. Upon releasing the reset line, an appropriate Reset Config Word is driven on the data bus and the RSTCFG is driven low in order to force the CPU to take the external Reset Config Word. The Reset Config Word is set so that the ECU boots from /CS0 (which is now the ETK CS) and executes the boot programming (recovery) code from the ETK memory. The recovery program code accepts data via the ETK mailbox and programs it into the ECU flash, which is now accessible (and thus programmable) via /CS2. When flash programming is done, the microcontroller must be forced into reset again and the changes done before must

be reverted. When reset is released next time, the microcontroller takes its Reset Configuration Word from the ECU main board and boots from the ECU Flash to execute the recently programmed code.

To avoid bus contentions when the ETK drives the Reset Configuration Word the data bus of the microcontroller must not be hard-wired to V_{CC} or GND or driven by a strong driver. Instead, the bus must either be driven by a driver that is disabled when the ETK is driving the Reset Config Word or by weak pull-up or pull-down resistors. This affects the data bus and the /RSTCONF and EPEE signals.

3.12 Reset

The primary requirements for ETK reset mechanism is to ensure that power-up and power-down behavior of ECU is clean and smooth and to prevent corruption of data stored in the ETK.

To accomplish this the ETK senses the $V_{CC2.6V}$ of the ECU. 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 CAL tool (ES590/ES591) unplugged. In addition, the ETKP9.0 senses the status of the /PORESET and /HRESET lines to generate a write protect signal for its memory. Finally, the ETKP9.0 can generate a reset signal by pulling /PORESET to keep the ECU in reset while the ETK is in power save mode and to prevent the µC from starting until the ETK is ready to work. The ETK is ready to work when it has has finished its initialization after leaving power save mode or after initial power-up. This feature allows it also to reset the ECU under tool control (required for INCA and ProF) and to perform an emergency stop of the ECU in case of ETK failure.

3.12.1 Power-down Sequence

In order to allow usage of the special KAPWR feature of the Freescale microcontroller, the ETKP9.0 is not allowed to continously pull the /PORESET signal when the ETK enters the power saving (sleep) mode (Red LED off) and the ECU is shut off (however with the KAPWR-powered part of microcontroller kept running).

Neither the ETK nor the ECU pulls /PORESET or /HRESET in this state. Hence, the ETKP9.0 memory protection has to be guaranteed by ECU software, which has to perform a write access to a special address in the trigger segment prior to shutdown of the ECU to disable the ETK. This makes the ETK non-writable by the ECU to protect the ETK content. This is only required when the ECU does not generate a reset by itself like an ECU which does not use the KAPWR feature.

3.12.2 Power-up Sequence

When the ignition is turned on both ETKP9.0 and ECU perform their reset sequence: The ECU generates a power-on reset while the ETK generates a /PORESET as soon as ECU power is sensed OK. This is important if the ETK does a cold boot. The subsequent ETK behavior is now configurable by a ETK Config Tool feature:

- ETK automatically enters "Enabled" state:

  No enabling by trigger segment write is required to stay compatible with old ETKs.

- ETK remains in "Disabled" state:

  The ECU software must enable the ETK by a trigger segment write. This is the solution for ECU projects using the KAPWR feature.

Special attention must be paid to the protection of the ETK data against accidental overwriting during power-up:

- ETK automatically enters "Enabled" state after power-up

  The data in the ETK memory is safe because the ETK keeps the µC in reset (via /PORESET) until ECU power is OK. The ETK is initialized and write-protects its memory as long as /PORESET is active. However, during short power losses (brownout) the ETK may become "Enabled" during repetitive power-down / power-up sequences. This means that the ETK will remain enabled and since no reset generated at the next power-down the ETK data might be overwritten.

- ETK remains in "Disabled" state after power-up

  In this case the data in ETK memory are safe because the ETK remains "Disabled" over repetitive power-down / power-up sequences. This means that the data in the ETK are safe, even though no reset is generated at the next power-down.

4 Installation

In this chapter, the hardware installation of the ETKP9.0 is described.

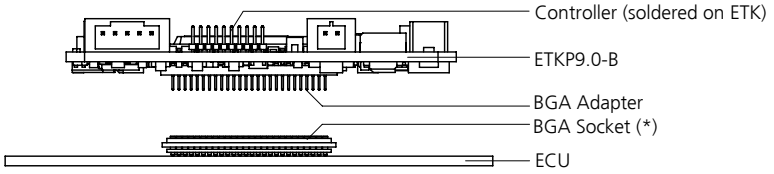
CAUTION!

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.

4.1 Connection to the ECU

For mounting the ETK on the ECU and for mounting the microcontroller on the ETK, the 388 pin Advanced Interconnect socket is required. It need to be ordered seperately (refer chapter "Ordering Information" on page 49).

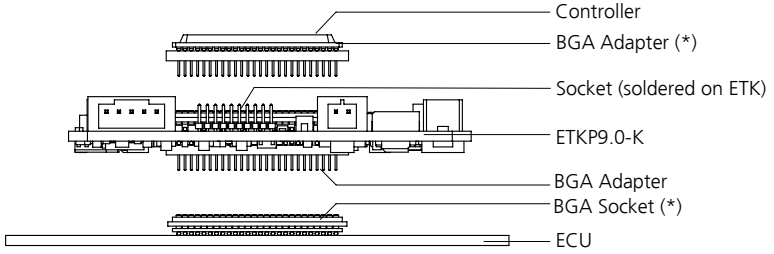
4.1.1 ETKP9.0-B



(*) Not delivered with ETK

Fig. 4-1 ETKP9.0-B Connection to the ECU

4.1.2 ETKP9.0-K



(*) Not delivered with ETK

Fig. 4-2 ETKP9.0-K Connection to the ECU

4.2 Connecting to the Power Supply

The ETKP9.0 needs a permanent power supply (refer chapter "Power Supply" on page 21). There are different versions to ensure it.

4.2.1 Permanent Power Supply inside ECU available

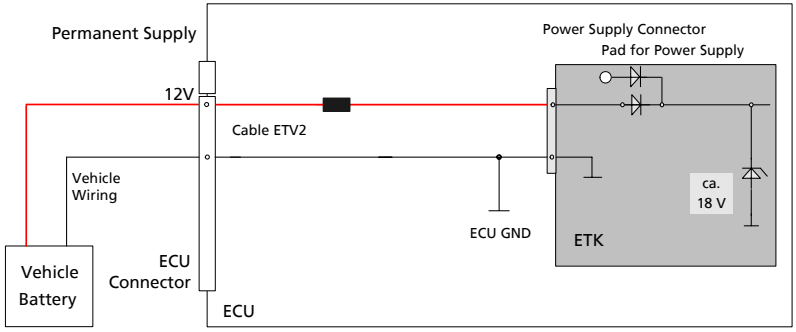


Fig. 4-3 Permanent Power Supply inside ECU available

4.2.2 Permanent Power Supply inside ECU not available

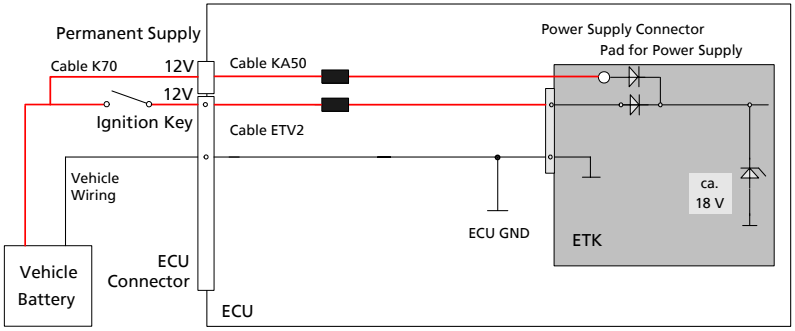


Fig. 4-4 Permanent Power Supply inside ECU not available

4.2.3 Isolated Power Supply inside ECU

Galvanically isolation will not be a required at the ETKP9.0. If a customer does need that, a external hardware (ETP2) can be used for that issue.

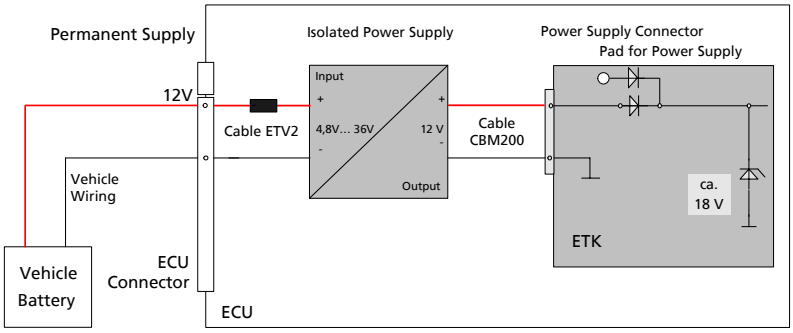


Fig. 4-5 Isolated Power Supply inside ECU

5 ETK Configuration

In this chapter, the configuration parameters of the ETKP9.0 are described.

5.1 ETK Configuration Tool

Generating a valid configuration data set is supported by the "ETK Configuration Tool". The "ETK Configuration Tool" contains information on all available ETKs. 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 measured 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 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 processor. All inputs are checked for plausibility, to make sure that a valid configuration is generated.

The "ETK Configuration Tool" can create the following output:

1. Direct ETK configuration
2. Storage of the configuration in a data file
3. The corresponding ASAP input

The most important outputs are the entries for the ASAP file. The parameter ETK_CFG is created and contains the complete ETK configuration of the ECU interface in hex code. If this parameter is 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 for the corresponding project.

5.2 Configuration Parameter

The configuration of the ETKP9.0 is possible through the "ETK Configuration Tool". Not all combinations of parameters make sense. The "ETK Configuration Tool" provides support concerning the configuration parameters. The following is a list with configuration parameters:

- **Chip Select for ETK** (/CS0, /CS1, /CS2, /CS3)

  Selects the ETK chip selects.

  The default value is "/CS2".

- **Reset CFG** (Enabled, Disabled)

  – Enabled: the ETK forces the Reset Configuration Word,

  – Disabled: the ETK does not force the Reset Configuration Word (the Reset Configuration Word from the ECU does not get changed by the ETK).

  The default value is "Disabled".

- **RST_CFG** (Reset Configuration Word)

  The Parameter RST_CFG can be modified to fit the hardware architecture of the ECU.

- **Chip Select 0** (Mapped to /CS0, /CS1, /CS2, /CS3)

  The Chip Select 0 of the ECU gets remapped to be able to place another memory area on the chip select /CS0. With this remapping the ECU can be forced to boot from the ETK memory and start a bootstrap routine for flashing. This feature should not be used by the user separately, but is only needed in the braindead flashing context.

  The default value is "/CS0".

- **Flash EPEE** (Write protected, Write enabled)

  With this flag the state of the EPEE line of the microcontroller can be determined. This is needed to choose if the MPC56x internal Flash is write protected.

  The default value is "Write protected".

- **Power-On State** (Active, Inactive)

  This feature is needed in the "Keep Alive Power" context. It defines if the ETK is already active when it starts after a ECU reset or if it needs to be enabled by the ECU software. Inactive means that the memory of the ETK can not be read or written with the exception of the trigger segment.

  The default value is "Active" to be compatible with older projects.

- **ETK Usage as** (ETK mode initialized, ETK mode not initialized, RAM adaptor not initialized, RAM adaptor initialized, ETK disabled)

  This feature allows it to use the ETKP9.0 as a RAM extension. The possible states are

  – ETK mode initialized: The ETK is used in the normal way. Please note that when using the ETK together with INCA this mode gets set when an ASAM-2MC configuration is written to the ETK.

  – ETK mode not initialized: normal ETK operation, but when a power fail occurs no data gets copied from the backup flash into the dual ported RAM pages.

  – RAM adaptor not initialized: The ETK is used as RAM extension.

  – RAM adaptor initialized: The ETK is used as RAM extension. If a power fail occurs the memory from the backup flash gets copied into the RAM.

  – ETK disabled: The ETK is invisible to the ECU.

  The default value is "ETK mode initialized".

  In all "ETK usage as" modes except "ETK mode initialized" the ETKP9.0 is not in its normal operation mode, i.e. measurement and calibration are not possible.

Note

Do not use the ETK together with INCA with any another state than "ETK mode initialized". Always reconfigure the ETK after is was used as RAM adaptor to avoid unexpected behaviour of INCA.

6 Technical Data

6.1 Environmental Conditions

Item	Characteristics
Temperature range	- 40 °C to +110 °C - 40 °F to +230 °F

6.2 CPU Interface

Item	Characteristics
Supported microcontrollers	Freescale MPC561/MPC562, MPC563/MPC564

6.3 Configuration

Item	Characteristics
Configuration	Project-specific configuration for - memory configurations stored in EEPROM
Update	Logic devices updated through software

6.4 Serial ETK Interface

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

6.5 Power Supply

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Permanent Power Supply from car battery	U_{Batt1}		4.3	12	18	V
Standby Current	I_{STBY}	U_{Batt1} = 12 V; ECU off; T = 20 °C	0.1	10	20	mA
Operating Current	I_{Batt}	U_{Batt} = 12 V; ECU on; 100 MBit; T = 20 °C	30	70	100	mA
Power Supply from ECU (sense)	U_{SG}	>2.01 -> ECU on <1.96 -> ECU off		2.6		V
Supply Current from ECU (sense)	U_{SG}	U_{SG} = 2.6 V			0.1	mA

6.6 Testcharacteristics

Parameter	Symbol	Condition	Min	Max	Unit
Reset delay 1	t_{Reset1}	U_{Batt1}=12 V U_{SG}= 0 V↑ 3.3 V without transferring Flash	29	40	ms
Reset delay 2	t_{Reset2}	U_{Batt1}=12 V U_{SG}= 0 V↑ 3.3 V with transferring Flash	129	150	ms
Reset delay 3	t_{Reset3}	U_{Batt1}=0 V↑ 12 V transfer FPGA and Flash	360	400	ms

Note

t_{Reset1}: Delay of ECU reset through ETK without transferring the Flash (U_{Batt1} present, USG will be switched on)
t_{Reset2}: Delay of ECU reset through ETK with transferring the Flash (U_{Batt1} present, transfer active, USG will be switched on)
t_{Reset3}: max. delay of ECU reset through ETK (U_{Batt1} and USG will be switched on)

6.7 Electrical Characteristics

Signal	Pin Type	V_{OH} (min) [V]	V_{OH} (max) [V]	V_{IL} (max) [V]	V_{IH} (min) [V]	V_{IH} (max) [V]	Leakage current [µA]	Additional Load by ETK (typ) [pF]
ADDR [29 ... 12]	I	-	-	0.7	1.6	4.6	-7/+7	10
DATA [31 ... 0]	I/O	2.0 2)	2.5	0.7	1.6	4.6	-12/ +12	13
RD_/WR	I	-	-	0.7	1.6	4.1	-12/ +12	10
/OE	I	-	-	0.7	1.6	4.1	-12/ +12	10
/WE_AT [3 ... 0]	I	-	-	0.7	1.6	4.1	-12/ +12	10
/CS [3 ... 0]	I	-	-	0.7	1.7	4.0	-17/ +17	15 4) 30 5)
/HRESET	I	-	-	0.7	1.7	5.5	-27/ +27	22
/PORESET 1)	I / OD	-	-	0.7	1.7	5.5	-27/ +32	52
EPEE (with 100 Ω Series Resistor)	OS	2.0 3)	2.5	-	-	5.5	-15/ +30	20
/RSTCONF	OD	-	-	-	-	4.1	-12/ +12	20

1) /PORESET: opendrain FET; I_{Dmax} = 0.2 A
2) at -6 mA load
3) at -4 mA load
4) /CS not routed to ECU /CS0 (selectable by CFG tool)
5) /CS routed to ECU /CS0

6.8 Switching Characteristics

The following diagrams show the timings the ETKP9.0 can process.

Note

All timings are measured at a reference level of 1.5 V. Output signals are measured with 10 pF to ground and 50 Ω to 1.5 V.

6.8.1 Read Timing: Data Emulation and Measurement Data DPR

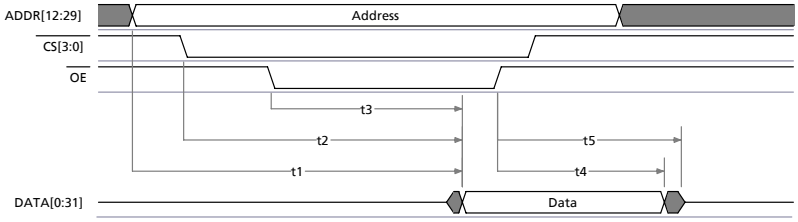


Fig. 6-1 Read Cyle: Data Emulation and Measurement Data DPR

Para.	Description	Min	Max	Unit
t_1	Address access time		18	ns
t_2	Chip select access time		23	ns
t_3	Output enable until valid data is driven to bus		17	ns
t_4	Valid data is driven to bus after output enable inactive	4	11	ns
t_5	Time after read until other device may drive bus		12	ns

6.8.2 Write Timing: Data Emulation and Measurement Data DPR

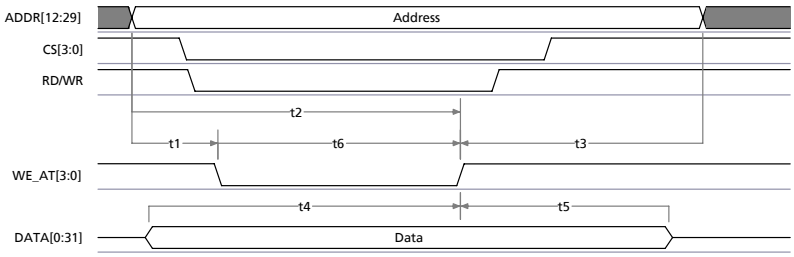


Fig. 6-2 Write Cycle: Data Emulation and Measurement Data DPR

Para.	Description	Min	Max	Unit
t_1	Address valid before write enable becomes active	0		ns
t_2	Address valid before end of write	6		ns
t_3	Address valid after end of write	4		ns
t_4	Data valid before end of write	4		ns
t_5	Data valid after end of write	4		ns
t_6	Write enable pulse width	9		ns

6.9 Mechanical Dimensions

The reference measure for all drawings is millimeter.

Dimensions	Millimeters	Inches
Length	61.00	2.402
Width	64.00	2.520
Thickness of PCB	1.70	0.067
Height of component (upper side)	5.50	0.217
Height of component (lower side)	2.00	0.079

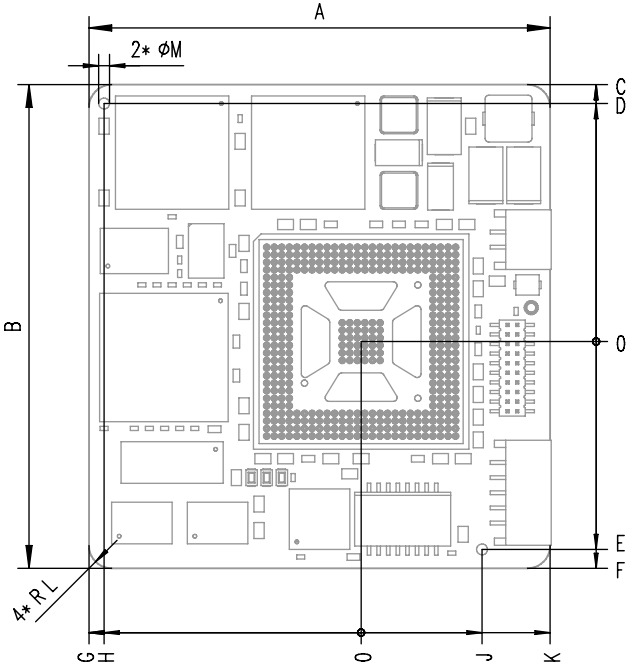


Fig. 6-3 ETKP9.0 Dimensions - Top View

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	61.00	2.402	G	36.00	1.417
B	64.00	2.520	H	34.00	1.339
C	34.00	1.339	J	16.00	0.630
D	31.50	1.240	K	25.00	0.984
E	27.50	1.083	L	3.00	0.118
F	30.00	1.181	M	1.45	0.057

6.9.1 ETKP9.0-B

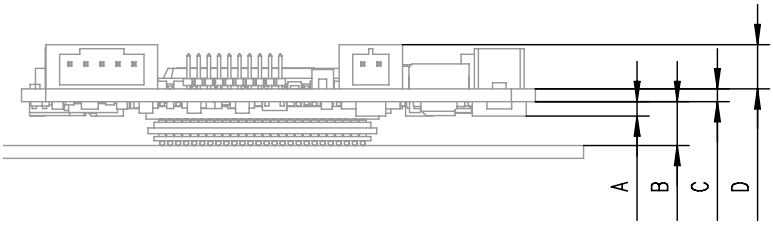


Fig. 6-4 Mechanical Dimensions ETKP9.0-B: Microcontroller directly soldered

For mounting the ETK on the ECU, the Advanced Interconnect Socket is required (see ordering information).

Dim	Millimeters	Inches
A	2.00	0.079
B	5.48	0.216
C	1.70	0.067
D	3.28	0.129

6.9.2 ETKP9.0-K

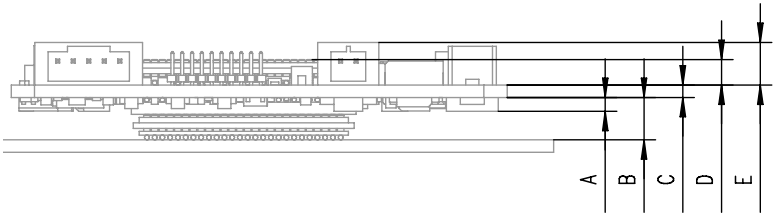


Fig. 6-5 Mechanical Dimensions ETKP9.0-K: Microcontroller with Socket Adapter mounted

For mounting the ETK on the ECU, and for mounting the microcontroller on the ETK, the Advanced Interconnect Socket is required (see ordering information).

Dim	Millimeters	Inches
A	2.00	0.079
B	5.48	0.216
C	1.70	0.067
D	3.28	0.129
E	5.50	0.217

7 Cables

Note

The cables showed in chapter "Cables" on page 43 are not included in the ETKP9.0 delivery. They need to be ordered separately. For order numbers refer to chapter "Ordering Information" on page 49.

7.1 Interface Cables

7.1.1 Interface Cable KA41 for Insert Socket, Proposal 1

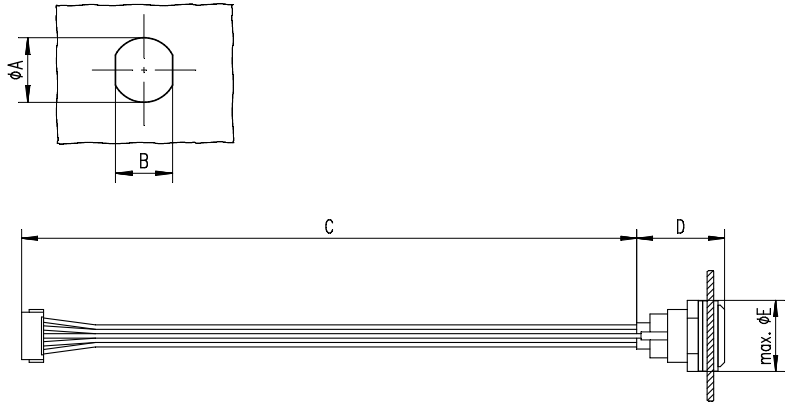


Fig. 7-1 Interface Cable KA41, Prop. 1

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	13.90	0.547	**D**	20.00	0.787
B	12.30	0.484	**E**	16.20	0.636
C	140.00	5.512			

Note

Shield not connected to ECU housing.

7.1.2 Interface Cable KA41 for Insert Socket, Proposal 2

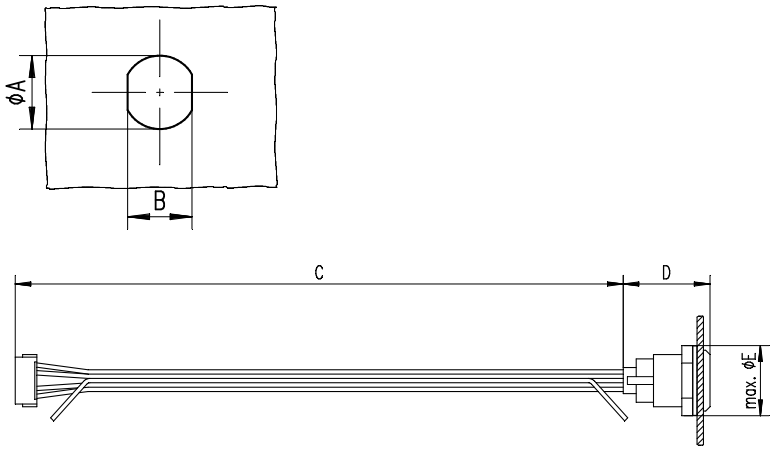


Fig. 7-2 Interface Cable KA41, Prop. 2

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	12.10	0.476	**D**	20.00	0.787
B	10.60	0.417	**E**	16.20	0.636
C	140.00	5.512			

Note

Shield connected to ECU housing. Insulating disc must be removed.

7.1.3 Interface Cable KA54 with PG-screwing

Note

The screws for mounting cables KA54 showed in chapter "Interface Cable KA54 with PG-screwing" on page 45 are not included in the KA54 delivery. They need to be ordered separately. For screw manufacturers and order numbers refer to the description of the cables.

Interface Cable KA54 with PG-screwing, Proposal 1

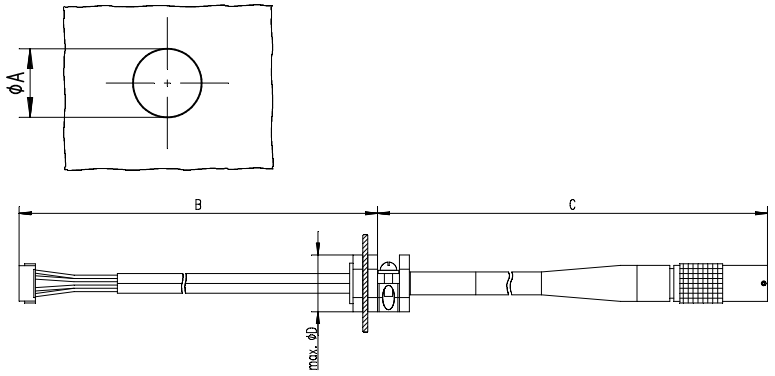


Fig. 7-3 Interface Cable KA54, Prop. 1

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*

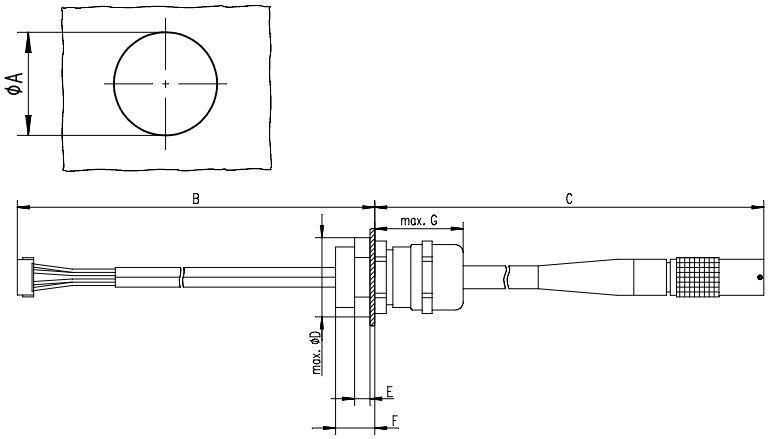


Fig. 7-4 Interface Cable KA54, Prop. 2 (long thread)

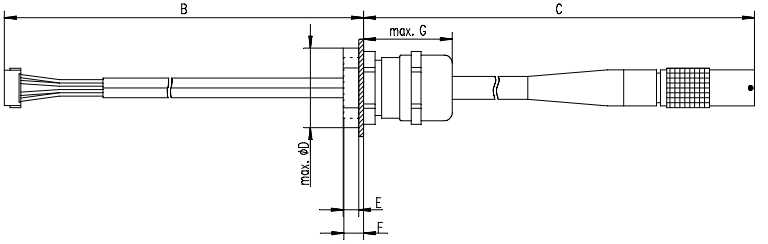


Fig. 7-5 Interface Cable KA54, Prop. 2 (short thread)

Dim	Millimeters	Inches	Dim	Millimeters	Inches
A	18.80	0.740	**E**	4.70	0.185
B	160.00	6.299	$\mathbf{F}_{Long}$	12.00	0.472
C	400.00	15.748	$\mathbf{F}_{Short}$	6.00	0.263
D	24.25	0.955	**G**	27.00	1.063

Note

Shield connected to ECU housing.

SKINTOP *compact screwing;* ***Manufacturer:*** *Lapp;* ***Description:*** *MS-SC 11 ;* ***Order-No.:*** *5311 2320 (long thread) or 5311 2220 (short thread)*

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

7.1.4 Interface Cable KA55

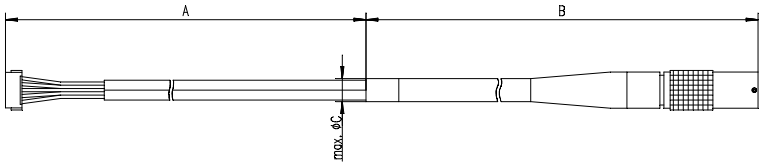


Fig. 7-6 Interface Cable KA55

Dim	Millimeters	Inches
A	160.00	6.299
B	400.00	15.748
C	7.50	0.295

Note

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

7.2 Power Supply Cables

7.2.1 Cable ETV

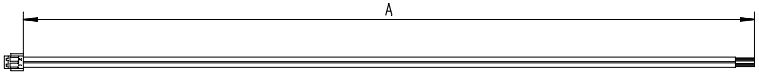


Fig. 7-7 Power Supply Cable ETV

Dim	Millimeters	Inches
A	190.00	7.480

7.2.2 Cable with Filtercoil ETV2

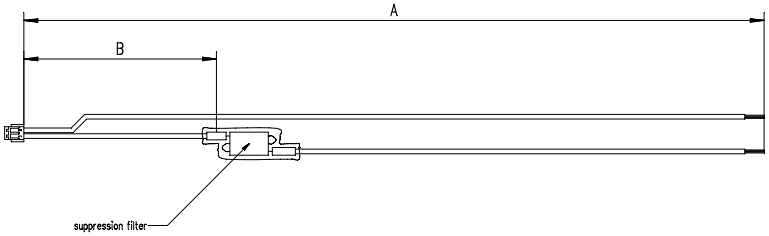


Fig. 7-8 Power Supply Cable with Filtercoil ETV2

Dim	Millimeters	Inches
A	190.00	7.480
B	50.00	1.969

8 Ordering Information

8.1 ETKP9.0

Type	Order-No.	Note
ETKP9.0-B	F-00K-102-919	ETKP9.0 (microcontroller to be supplied by customer)
ETKP9.0-K	F-00K-103-914	ETKP9.0 (with 388 pin microcontroller socket)

8.2 Sockets and Adapters

Note

Adapters are available from local Advanced Interconnect distributors.

8.2.1 Sockets ECU - ETK

Note

For mounting the ETK on the ECU, the of the following Advanced Interconnect Sockets must be used. Please do not use other sockets.

ECU Controller	ECU Socket
MPC561, MPC562, MPC563, MPC564	Advanced Interconnect Socket 1FHS388-716GG (388 pins)

8.2.2 BGA Adapter ETK - Microcontroller

Note

For mounting the microcontroller on the ETK the following Advanced Interconnect Adapter must be used. Please do not use other adapters.

Controller	Adapter
MPC561, MPC562, MPC563, MPC564	Advanced Interconnect BGA Adapter FHA388-715G (388 pins)

8.3 Isolated Power Supply

Type	Order-No.	Note
ETP2	F 00K 104 010	

8.4 Cables

Note

The cables showed in chapter "Cables" on page 43 are not included in the ETKP9.0 delivery.

Note

The screws for mounting cables KA54 showed in chapter 7.1.3 on page 45 are not included in the KA54 delivery. They need to be ordered separately. For screw manufacturers and order numbers refer to the description of the cables.

Type	Order-No.	Note
Interface Cables:		
KA41, Prop. 1 / Prop. 2	Y 261 A24 729	
KA54, Prop. 1 / Prop. 2	F 00K 001 302	Delivery without PG-screwing
KA55	F 00K 001 303	
Power Supply Cables:		
ETV	Y 261 A24 446	
ETV2	F 00K 000 593	
K70	Y 261 A24 942	External power supply for ETKs (connector)
KA50	F 00K 000 940	External voltage supply cable with jack and filter coil
CBM200-0m1	F 00K 900 052	Cable JST PH - JST PH (2fc-3fc, 0M1)

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