ES4455.2 Load Carrier Board

ES4450.3 Load Carrier Board for 4 RB CRS Injectors
ES4451.4 Load Carrier Board for 4 RB GDI Injectors
ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO
ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO
ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA
ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO

User's Guide

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V1.0.0 R05 EN - 09.2019

Contents

1 Introduction

This User's Guide contains the description of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules.

This chapter contains information about the following topics:

1.1 Properties

The ES4455.2 Load Carrier Board is a carrier board for load simulations, e.g. injector loads, in a LABCAR HiL system.

To simulate injector loads, the following variants mounted with load modules based on the ES4455.2 Load Carrier Board are available:

- ES4450.3 Load Carrier Board for 4 RB CRS Injectors
- ES4451.4 Load Carrier Board for 4 RB GDI Injectors
- ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO
- ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO
- ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA
- ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO

ES4450.3 and ES4451.4 are the successors to ES4450.2 and ES4451.3. The ES4450.3 and ES4451.4 have the same functions as their respective predecessor models.

The ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO, ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO, the ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA and the ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO have an expanded scope of functions. They enable an additional more precise simulation and modulation of the injection time through integrated functions for the control algorithms of the ECU. These control algorithms are CVO (Controlled Valve Operation) control for gasoline direct injection in the case of ES4452.1, ES4453.1 and ES4458.1 or VCC (Valve Close Control) control and VCA (Valve Close Adjustment) control for diesel direct injection in the case of ES4457.1.
The expanded functions can be deactivated by the user in LABCAR OPERATOR. After deactivating the function for CVO, the ES4452.1 can be operated analogous to ES4451.4 and ES4451.3. Also, the ES4457.1 can be used in the same way as ES4450.3 and ES4450.2 after deactivating the function for VCC and VCA.

The ES4408.1 Load Chassis features three slots of width 14 HP to accept the ES4455.2 Load Carrier Board and the variants listed above. Fully mounted, it enables the simulation of 12 injection loads.

In the same way, it is possible to install the ES4455.2 Load Carrier Board and its mounted variants in the ES5300.1-A Housing and the ES5300.1-B Housing by means of the ES5372.1 Carrier for ES4455 Load Boards.
In the ES5300.1-A Housing and the ES5300.1-B Housing, it is possible to install 5 boards of width 14 HP. Fully mounted, it enables the simulation of 20 injection loads per housing.

1.1.1 Properties of the ES4455.2 Load Carrier Board and its Variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 Mounted with Load Modules

- 3 U/14 HP add-on card for a LABCAR HiL system.
- Compatibility with the ES4408.1 Load Chassis and, with the use of adapter card ES5372.1 Carrier for ES4455 Load Boards, also with the ES5300.1-A Housing and the ES5300.1-B Housing
- Four load inputs for connecting four simulated injection loads to an ECU
- Current measurement for four loads via four galvanically isolated channels
- Voltage measurement for four loads via four galvanically isolated channels
- Analog output Online_Probe for current or voltage measurement at one selectable load
- On-board analysis of load current and load voltage
- Four digital outputs I_Dig_Out_1...I_Dig_Out_4 for outputting the injection time for each load. Based on the load response, the opening and closing time of the respective load is also being output
- The signals I_Dig_Out_1, ... I_Dig_Out_4 can be connected to a LABCAR HiL system.

The variants have the following additional properties:

ES4455.2 Load Carrier Board

- Slot for 4 loads

ES4450.3 Load Carrier Board for 4 RB CRS Injectors

- Simulation for four injectors of the Bosch Common Rail System.

ES4451.4 Load Carrier Board for 4 RB GDI Injectors

- Simulation for injectors of the Bosch HDEV5 gasoline direct injection

ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO

- Simulation for injectors of the Bosch HDEV5 gasoline direct injection
- Additional supported functions of the motor ECU:
  CVO (Controlled Valve Operation) control

ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO

- Simulation for injectors of the Bosch HDEV6 gasoline direct injection
- Additional supported functions of the motor ECU:
  CVO (Controlled Valve Operation)

ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA

- Simulation for injectors of the Bosch Common Rail System CRI2-x
- Additional supported functions of the motor ECU:
  VCC (Valve Close Control) and VCA (Valve Close Adjustment)

ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO

- Simulation for Bosch PFI EV14 injectors
- Additional supported functions of the motor ECU:
  CVO (Controlled Valve Operation)

1.1.2 Block Diagram

Fig. 1-1 shows a block diagram of the ES4455.2 Load Carrier Board with four loads in the ES4408.1 Load Chassis.

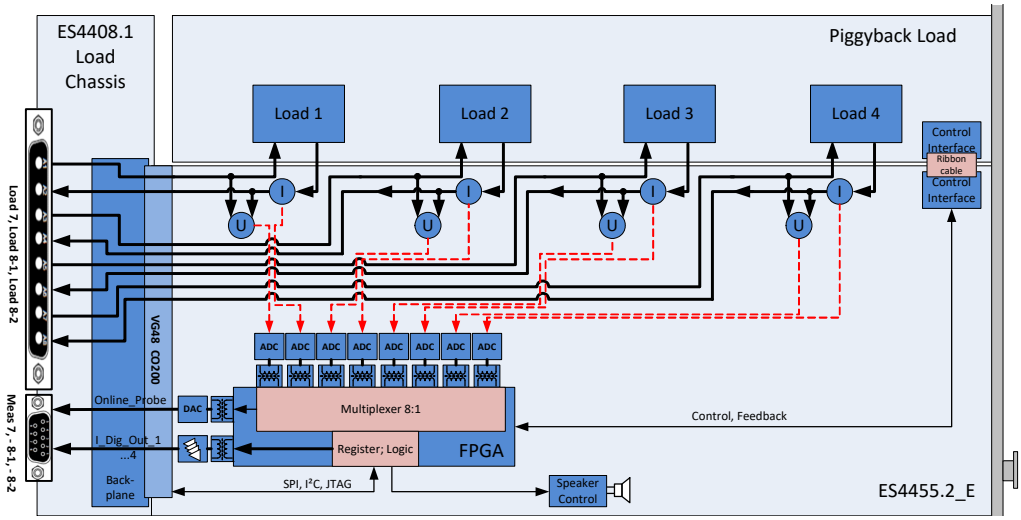

Fig. 1-1 Block diagram of the ES4455.2 Load Carrier Board with loads, installed in the ES4408.1 Load Chassis.

Fig. 1-2 shows a block diagram of the ES4455.2 Load Carrier Board with four loads in the ES5300.1-A Housing or ES5300.1-B Housing.

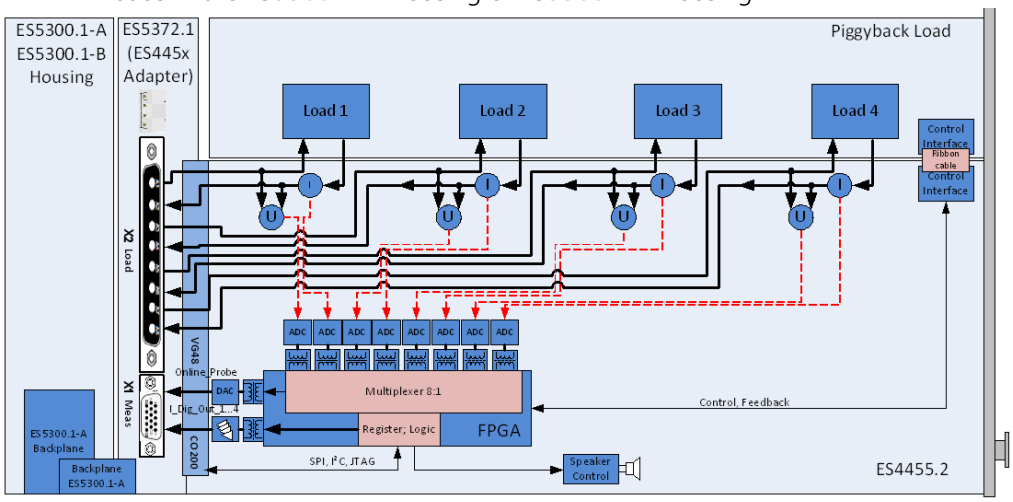

Fig. 1-2 Block diagram of the ES4455.2 Load Carrier Board with loads, installed in the ES5300.1-A Housing or the ES5300.1-B Housing.

1.2 Basic Safety Notices

Please observe the following safety notices to avoid health issues or damage to the device.

1.2.1 Identification of Safety Notices

The safety notices contained in this manual are identified with the danger symbol shown below:

The safety notices shown below are used for this purpose. They provide notes to extremely important information. Please read this information carefully.

CAUTION!

identifies a hazard with low risk that could result in minor or medium physical injuries or property damages if not avoided.

WARNING!

indicates a possible danger with moderate risk of death or (serious) injury, if not avoided.

DANGER!

indicates an immediate danger with a high risk of death or serious injury, if not avoided.

1.2.2 General Safety Information

Observe the following safety notices to avoid health issues or damage to the device.

Note

All product related documentation (product Safety Advice and this User's Guide) must be read prior to the startup of the product!

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

1.2.3 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 system integrator is responsible for the safety of systems that use the product.

General Safety at Work

Follow the existing regulations for work safety and accident prevention. All applicable regulations and laws regarding operation must be strictly adhered to when using this product.

1.2.4 Intended Use

The ES4455.2 Load Carrier Board, the ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 are plug-in cards for the ES4408.1 Load Chassis. With the help of ES5372.1 Carrier for ES4455 Load Boards, the plug-in cards can also be used in the ES5300.1-A Housing or in the ES5300.1-B Housing.

The ES4455.2 Load Carrier Board consists of the following:

- Slot for a load emulation for simulating injection valves with connections to ECU output stages
- Digital and analog output interfaces for the ES4408.1 or ES5300.1-A-based hardware-in-the-loop system or for connecting oscilloscopes or other measurement devices
- SPI Interface to the ES4408.1 Load Chassis or the ES5300.1-A Housing or the ES5300.1-B Housing

The ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 plug-in cards consist of the following:

- Load emulation for simulating injection valves with connections to ECU output stages
- Digital and analog output interfaces for the ES4408.1 or ES5300.1-A based hardware-in-the-loop system or for connecting oscilloscopes or other measurement devices
- SPI Interface to the ES4408.1 Load Chassis or the ES5300.1-A Housing and to the ES5300.1-B Housing

The ES4455.2 and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules may be operated only in the ES4408.1 Load Chassis, ES5300.1-A Housing and in the ES5300.1-B Housing.

The intended use of the ES4455.2 and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules is as follows:

- Use in industrial lab facilities or workplaces
- Hardware interface for ECUs in a hardware-in-the-loop test system
- Cooperation with ETAS software which supports the ES4408.1 Load Chassis or ES5300.1-A Housing or the ES5300.1-B Housing
- Interface in cooperation with software programs that operate the standardized, documented and open APIs of ETAS software products

The ES4455.2 and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules are **not** intended to be used as follows:

- Within a vehicle on the road
- As part of a life support system

- In applications where misuse can lead to injuries or damages
- In environments in which conditions prevail that fall outside the specified ranges: see "Ambient Conditions" on page 48
- With signal conditioning that falls outside the specified ranges: see "Technical Data and Standards" on page 47

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.

Requirements for Operation

The following requirements are necessary for safe operation:

- Use the product only according to the specifications in the corresponding User's Guide. With any deviating operation, the product safety is no longer ensured.
- Do not use the product in a wet or damp environment.
- Do not use the product in potentially explosive atmospheres.

Electrical Safety and Power Supply

Observe the regulations applicable at the operating location concerning electrical safety as well as the laws and regulations concerning work safety!

WARNING!

Danger from high voltages!
The components, plug connectors and conductor paths of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 may have dangerous voltages. These voltages can still be present even after the ES4455.2 and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 have been removed from the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing or if the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing have been switched off.
Make sure that the products are protected from external contact during operation. Switch off the ES5300.1-A Housing, the ES5300.1-B Housing or the ES4408.1 Load Chassis and unplug from the mains. Wait at least three minutes before removing the products.
Failure to do so poses a danger to life and health.

WARNING!

Danger - electromagnetic radiation!
During operation, the ES4455.2 Load Carrier Board and its populated variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 and loads connected to them, can emit electromagnetic radiation, which can cause cardiac pacemakers or implanted defibrillators to malfunction or become damaged.
The products may only be operated in areas where persons with pacemakers are prohibited from entering. The entrances to these areas must bear sign P007 "No access for persons with cardiac pacemakers or implanted defibrillators" in a clearly visible position in accordance with ISO 7010:2011 "Registered Safety Signs".
Failure to observe this rule can lead to health hazards and even death for persons with pacemakers and implanted defibrillators.

WARNING!

Fire hazard!
Use only fuses that meet the specification in Tab. 2-1 on page 31!
Never bridge defective fuses!
Failure to observe the fuse specification can lead to excess currents, short circuits and fires.

Power Supply

The products are powered by the ES4408.1 Load Chassis via the ES4408.1 Backplane Connector or, if mounted in an ES5372.1, via the ES5300.1-A Housing or ES5300.1-B Housing by the ES5300.1 Backplane Connector.

Insulation Requirements for Lab Power Supplies to Circuits Connected to the HiL System:

- The power supply to live circuitry must be safely isolated from the supply voltage. For example, use a car battery or a suitable lab power supply.
- Only use lab power supplies with dual protection for the supply network (with double/reinforced insulation (DI/RI)). This requirement is met by lab power supplies that comply with IEC/EN 60950 or IEC/EN 61010.
- The lab power supply must be approved for use at a height of 2000 m and in ambient temperatures of up to 40 °C.

De-energizing a Plug-in Board

Switch off the ES4408.1 Load Chassis or the ES5300.1-A Housing or ES5300.1-B Housing and connected power supplies, and unplug the power plug and other connectors attached to the plug-in board. Wait at least three minutes before removing the plug-in board.

Approved Cables

The signal lines must not exceed a maximum length of 3 m.

WARNING!

Fire hazard!
Use only approved cables for creating cable assemblies (e.g. for connecting the ECU and external loads). The cables used must be suitable particularly for occurring currents, voltages and temperatures and flame-retardant in accordance with one of the following standards IEC 60332-1-2, IEC 60332-2-2, UL 2556/UL1581VW-1!

Requirements for the Installation Location

WARNING!

This is class A equipment. This equipment can cause radio interference in residential areas. Should that be the case, the operator may be requested to institute reasonable measures.

Requirements for Ventilation

CAUTION!

The air circulation inside the ES4408.1 Load Chassis, the ES5300.1-A housing and the ES5300.1-B housing can be ensured only if all free slots are covered with front plates. Otherwise, it may lead to overtemperatures and trip the overtemperature protection of the ES5300.1-A or the ES5300.1-B. For this reason, install front plates in all free slots!

Transport and Installation

To avoid damages to the hardware from electrostatic discharge, please observe the following precautionary measures:

CAUTION!

Some components of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 can be damaged or destroyed through electrostatic discharges. Leave the plug-in card in its transport packaging until its installation. The ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 may be removed from the transport packaging, configured and installed only at a workplace that is well secured against static discharges.

CAUTION!

In order to prevent damage to the plug-in boards and the LABCAR housing, and thereby also avoid damage to property or health, observe the installation instructions and information contained in the relevant User's Guides.

CAUTION!

If cards (e.g. for startup or calibration) are unlocked but not completely removed from the housing, they must be pulled out far enough that the distance between the respective card and the backplane of the housing is at least 1 cm. Otherwise, contacts may be established between the cards and lead to their destruction.

Connecting/Disconnecting Devices

To avoid injuries and hardware damages, observe the following precautionary measures:

- Do not apply any voltages to the connections of the products that do not correspond to the specifications of the respective connection.
- Do not connect or disconnect any devices while the ES4408.1 Load Chassis, the ES5300.1-A Housing or ES5300.1-B Housing or connected devices are switched on. First, switch off the ES4408.1 Load Chassis, the ES5300.1-A Housing or ES5300.1-B Housing by shutting down the real-time PC and by activating the On/Off switch at the rear and unplug the power cable.
- When plugging in connectors, ensure that they are inserted straight and no pins are bent.

Maintenance

The product does not require maintenance.

Repairs

If an ETAS hardware product needs to be repaired, return the product to ETAS.

Cleaning

The product is not expected to require cleaning.

1.3 Identifications on the Product

The Following Symbols are Used for Product Labeling:

Symbol	Description
	The User's Guide must be read prior to the startup of the product
	Marking for CE conformity (see "CE Mark" on page 15)
	Marking for KCC conformity (see "KC Mark" on page 15) Only for ES4452.1 and ES4457.1
	Marking for China RoHS, see chapter (see "RoHS Conformity" on page 16)
	Marking for conformity with WEEE directive (see "Product Return and Recycling" on page 16)
	Identification in accordance with ISO 7010:2011, P007: "No access for persons with pacemakers and implanted defibrillators." "Operational malfunction or damage to pacemakers and implanted defibrillators".

Please observe the information in the chapter "Technical Data and Standards" on page 47.

1.3.1 CE Mark

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

1.3.2 KC Mark

With the KC mark attached to the product and its packaging, ETAS confirms that the product has been registered in accordance with the product-specific KCC guidelines of the Republic of Korea.

1.3.3 RoHS Conformity

European Union

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

ETAS confirms that the product meets this directive applicable in the European Union.

China

With the China RoHS identification attached to the product or its packaging, ETAS confirms that the product meets the guidelines of the "China RoHS" (Management Methods for Controlling Pollution Caused by Electronic Information Products Regulation) applicable in the People's Republic of China.

1.3.4 Identification in Accordance with ISO 7010:2011

Under consideration of the standard ISO 7010:2011, the product is labeled with the symbol P007: "No access to persons with pacemakers or implanted defibrillators".

The products may be used only in areas to which persons with pacemakers and implanted defibrillators have no access. The user is obligated to attach a label in accordance with ISO 7010:2011, P007: "No access to persons with pacemakers or implanted defibrillators", to the entrances to the areas in which the product is used.

1.4 Product Return and Recycling

The European Union (EU) released the Directive for Waste Electrical and Electronic Equipment - WEEE to ensure the setup of systems for collecting, treating and recycling electronic waste in all countries of the EU.

This ensures that the devices are recycled in a resource-friendly way that does not represent any risk to personal health and the environment.

Fig. 1-3 WEEE symbol

The WEEE symbol on the product or its packaging identifies that the product may not be disposed of together with the remaining trash.

The user is obligated to separately collect old devices and provide them to the WEEE return system for recycling.

The WEEE Directive applies to all ETAS devices, but not to external cables or batteries.

Additional information about the recycling program of ETAS GmbH is available from the ETAS sales and service locations (see "ETAS Contact Addresses" on page 51).

1.5 Materials Subject to Declaration

Some products from ETAS GmbH (e.g. modules, boards, cables) use components with materials that are subject to declaration in accordance with the REACH regulation (EC) 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.

1.6 About this Manual

This manual consists of the following chapters:

- "Introduction" on page 5

  This chapter.
- "Design of an Injector Simulation Environment" on page 21

  This chapter describes how the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1mounted with load modules can be integrated in a LABCAR HiL system.
- "Properties and Functions" on page 21

  This chapter features a description of the properties and functions of the components of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules.
- "Connections and Connectors" on page 37

  This chapter describes the connections of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 that are mounted with load modules.
- "Technical Data and Standards" on page 47

  This chapter contains information about the technical data and standards of the products.
- "Ordering Data and Scope of Delivery" on page 49

1.6.1 Working with this Manual

Presentation of Information

All activities to be performed by the user are presented in a "Use Case" format. That is, the goal to be accomplished is briefly defined in the heading, and the respective steps required for reaching this goal are then presented in a list. The presentation looks as follows:

Target definition

any advance information...

1. Step 1

   Any explanation for step 1...
2. Step 2

   Any explanation for step 2...

Any concluding comments...

Specific example:

Creating a new file

Before creating a new file, no other file may be open.

1. Select **File** → **New**.

   The "Create File" dialog box appears.

2. Enter the name for the file in the "File Name" field.
   The file name may not have more than 8 characters.
3. Click on **OK**.

The new file is being created and saved under the name you specified. You can now work with the file.

Typographical Conventions

The following typographical conventions are used:

Select **File** → **Open**.	Menu commands are displayed in bold/ blue.
Click on **OK**.	Buttons are displayed in bold/blue.
Press <ENTER>.	Key commands are printed in small capitals enclosed in angle brackets.
The "Open File" dialog window appears.	Names of program windows, dialog windows, fields and similar are given in quotation marks.
Select the `setup.exe` file.	Text in selection lists, program code, as well as path and file names are displayed using the `Courier` font.
A conversion between the logical and arithmetic data types is *not* possible.	Content-based highlights and newly introduced terms are placed in *italics*.

Important notes for the user are presented as follows:

Note

Important note for the user.

2 Properties and Functions

This chapter features a description of the properties and functions of the components of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules.

2.1 Design of an Injector Simulation Environment

This chapter describes how the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1mounted with load modules can be integrated in a LABCAR HiL system.

Fig. 2-1 on page 22 and Fig. 2-2 on page 23 each show a block diagram for integrating the ES445x.y Load Carrier Boards in a LABCAR HiL system.

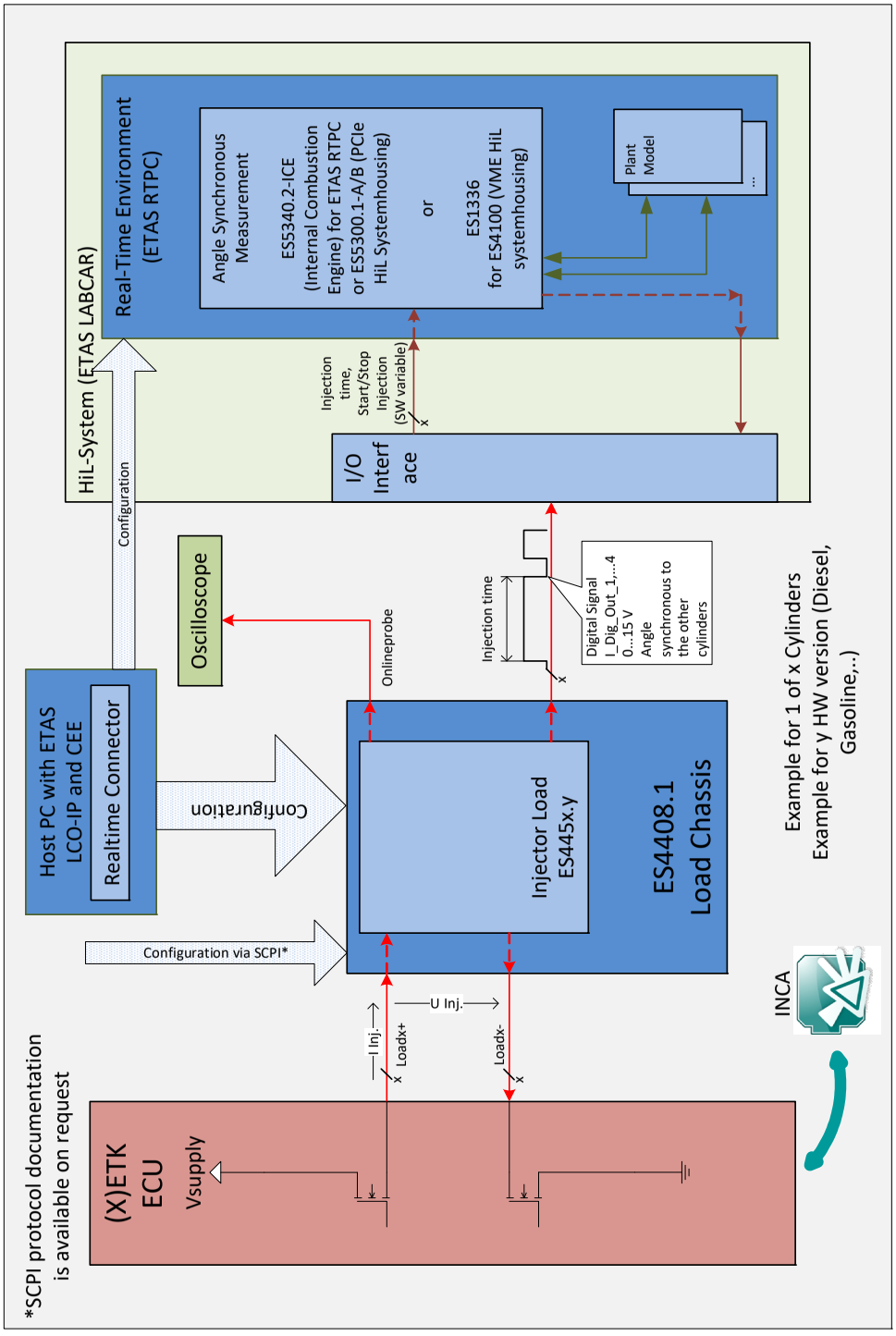

Fig. 2-1 Example for the integration of an ES445x.y in a LABCAR HiL system. The ES445x.y is installed in the ES4408.1 Load Chassis.

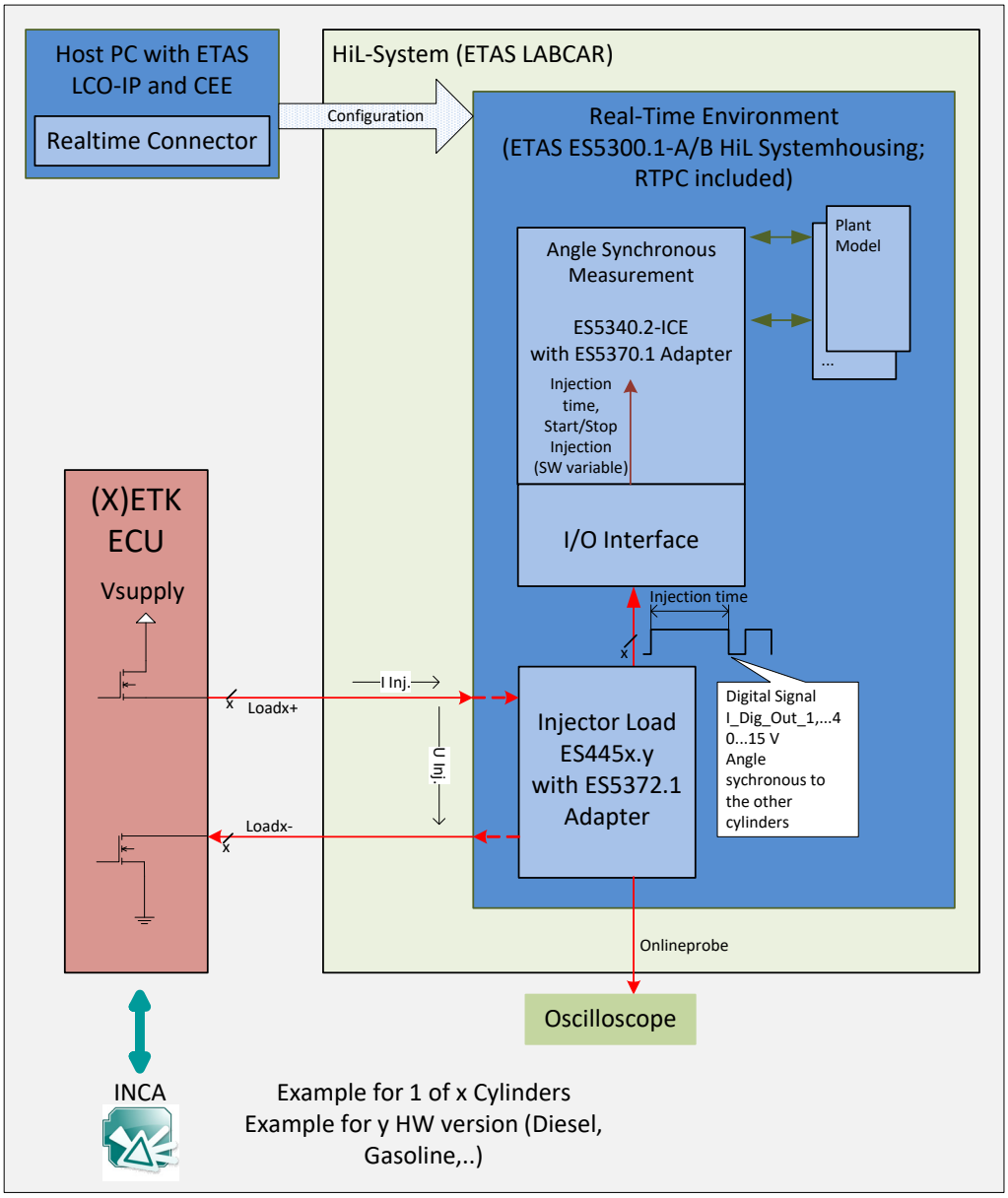

Fig. 2-2 Example for the integration of an ES445x.y in a LABCAR HiL system. The ES445x.y is installed in the ES5300.1-A Housing or the ES5300.1-B Housing.

2.2 Figures of ES4455.2 and its Mounted Variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1

2.2.1 ES4455.2 Load Carrier Board

The following figure shows the front plate on the left and the rear side of the ES4455.2 Load Carrier Board on the right. The variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules have the same front plate and the same backplane connector. On the front plate, the label of the blue type plate is adapted to the respective variant.

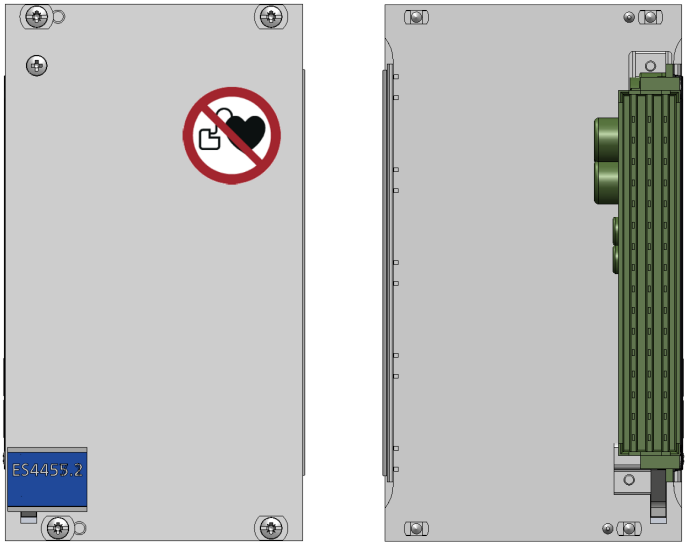

Fig. 2-3 Front plate (left) and rear side of the ES4455.2 Load Carrier Board

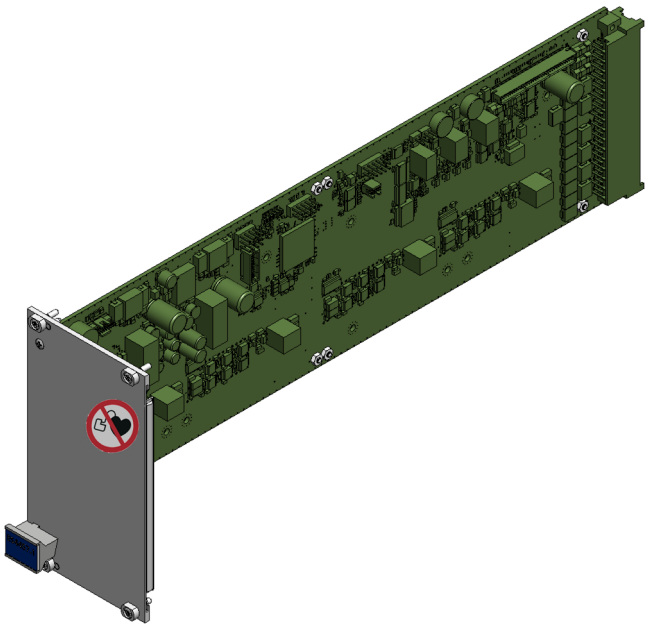

Fig. 2-4 ES4455.2 Load Carrier Board

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Note

The load modules of the ES4455.1 Load Board can also be operated with the ES4455.2 Load Carrier Board. However, the new load modules for CVO/ VCC,VCA, which are installed on the ES4452.1, ES4453.1, ES4457.1 and ES4458.1, cannot be operated with the ES4455.1 Load Board.

2.2.2 ES4450.3 Load Carrier Board for 4 RB CRS Injectors

The ES4450.3 Load Carrier Board for 4 RB CRS Injectors (Fig. 2-5) consists of the ES4455.2 Load Carrier Board and two load modules that each simulate two CRS injection loads. The load modules are the same as the ES4450.2 predecessor board (see also ES4455.1 User's Guide)

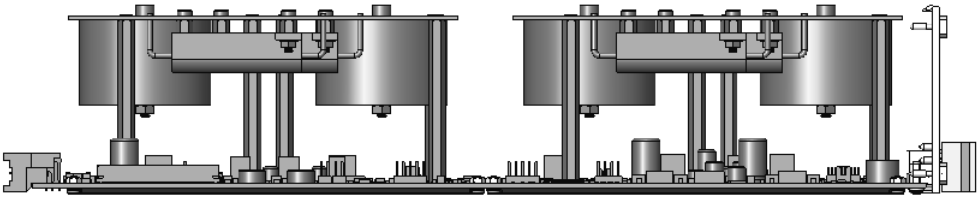

Fig. 2-5 ES4450.3 Load Carrier Board for 4 RB CRS Injectors

2.2.3 ES4451.4 Load Carrier Board for 4 RB GDI Injectors

The ES4451.4 Load Carrier Board for 4 RB GDI Injectors (Fig. 2-6) consists of the ES4455.2 Load Carrier Board and two load modules that each simulate two GDI injection loads. The load modules are the same as the ES4451.3 predecessor board (see also ES4455.1 User's Guide)

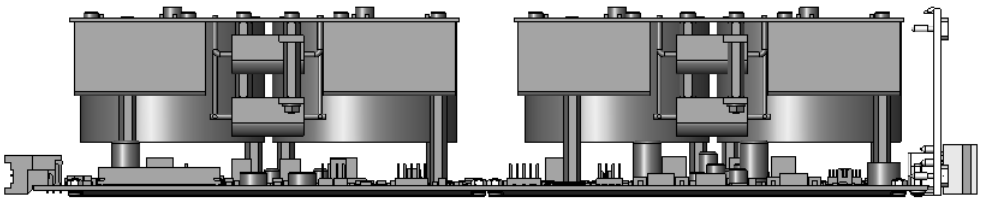

Fig. 2-6 ES4451.4 Load Carrier Board for 4 RB GDI Injectors

2.2.4 ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO

The ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO (Fig. 2-7) consists of the ES4455.2 Load Carrier Board and a load module installed on it for simulating four GDI injector loads. The load board is connected with the load module via a ribbon cable.

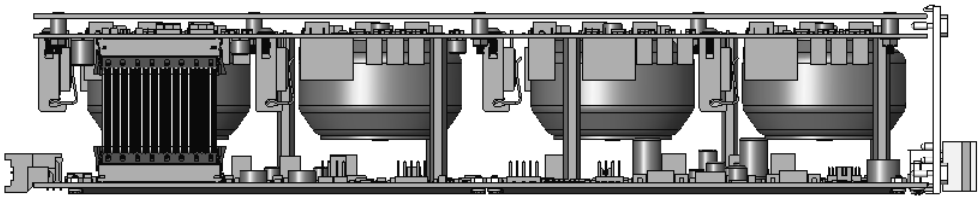

Fig. 2-7 ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO

2.2.5 ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO

The ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO (Fig. 2-8) consists of the ES4455.2 Load Carrier Board and a load module installed on it for simulating four GDI injector loads. The load board is connected with the load module via a ribbon cable.

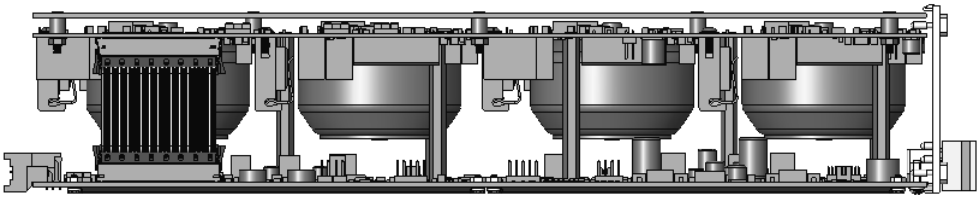

Fig. 2-8 ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO

2.2.6 ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA

The ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA (Fig. 2-9) consists of the ES4455.2 Load Carrier Board and a load module installed on it for simulating four CRS injector loads. The load board is connected with the load module via a ribbon cable.

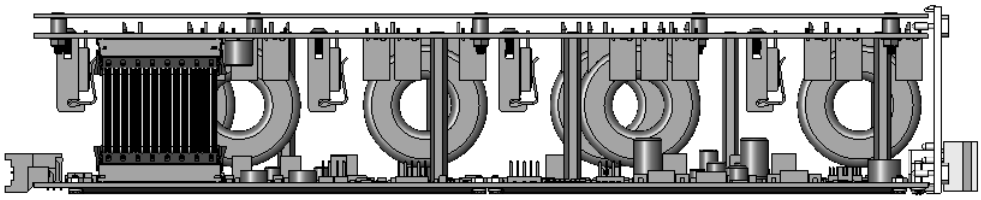

Fig. 2-9 ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA

2.2.7 ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO

The ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO consists of the ES4455.2 Load Carrier Board and a load module installed on it for simulating four RB PFI EV14 injectors. The load board is connected with the load module via a ribbon cable.

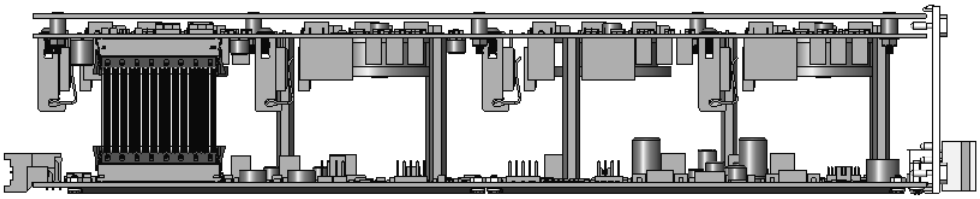

Fig. 2-10 ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO

2.3 Procedure for Installation and Removal

1. Before you start, create ESD-compliant conditions at your workplace.
2. Observe the following safety instructions and chapter 2.3.1, 2.3.2, 2.3.3 and 2.3.4.

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WARNING!

Danger - electromagnetic radiation!
During operation, the ES4455.2 Load Carrier Board and its populated variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 and loads connected to them, can emit electromagnetic radiation, which can cause cardiac pacemakers or implanted defibrillators to malfunction or become damaged.
The products may only be operated in areas where persons with pacemakers are prohibited from entering. The entrances to these areas must bear sign P007 "No access for persons with cardiac pacemakers or implanted defibrillators" in a clearly visible position in accordance with ISO 7010:2011 "Registered Safety Signs".
Failure to observe this rule can lead to health hazards and even death for persons with pacemakers and implanted defibrillators.

WARNING!

Danger from high voltages!
The components, plug connectors and conductor paths of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 may have dangerous voltages. These voltages can still be present even after the ES4455.2 and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 have been removed from the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing or if the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing have been switched off.
Make sure that the products are protected from external contact during operation. Switch off the ES5300.1-A Housing, the ES5300.1-B Housing or the ES4408.1 Load Chassis and unplug from the mains. Wait at least three minutes before removing the products.
Failure to do so poses a danger to life and health.

CAUTION!

Do not install any cards while the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing is switched on!

CAUTION!

Some components of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 can be damaged or destroyed through electrostatic discharges. Leave the plug-in card in its transport packaging until its installation. The ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 may be removed from the transport packaging, configured and installed only at a workplace that is well secured against static discharges.

CAUTION!

During the installation and removal of the plug-in cards ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 in or from the ES4408.1 Load Chassis, the ES5300.1-A Housing and the ES5300.1-B Housing, observe the following:
Always guide the plug-in cards with both hands. The cards are heavy and may fall if carried with one hand only.

CAUTION!

When installing the ES4452.1, ES4453.1, ES4457.1 and ES4458.1 in the ES4408.1 Load Chassis, the ES5300.1-A Housing and the ES5300.1-B Housing, ensure that the ribbon cable connecting the ES4455.2 Load Carrier Board and the load module does not protrude which could lead to damages.

CAUTION!

The air circulation inside the ES4408.1 Load Chassis, the ES5300.1-A Housing and the ES5300.1-B Housing can be ensured only if all free slots are covered with front plates. Otherwise, it may lead to overtemperatures and trip the overtemperature protection of the ES4408.1, the ES5300.1-A or the ES5300.1-B. For this reason, install front plates in all free slots!

2.3.1 Installation in the ES4408.1 Load Chassis

A description for the installation of the ES4455.2 Load Carrier Board and its mounted variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 is located in the User's Guide of the ES4408.1 Load Chassis.

2.3.2 Installation in the ES5372.1 Carrier for ES4455 Load Boards

A description for the installation in the ES5372.1 Carrier for ES4455 Load Boards is located in the User's Guide of the ES5372.1 Carrier for ES4455 Load Boards.

2.3.3 Installation in the ES5300.1-A Housing and the ES5300.1-B Housing via ES5372.1

A description for the installation of the ES4455.2 Load Carrier Board and its mounted variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 in the ES5300.1-A Housing or the ES5300.1-B Housing is located in the manual for the ES5300.1-A Housing or the ES5300.1-B Housing.

2.3.4 Connecting Cable

Use only approved cables for creating cable assemblies (e.g. for connecting the ECU and external loads).

Note

The cables used must be suitable particularly for occurring currents, voltages and temperatures and flame-retardant in accordance with one of the following standards IEC60332-1-2, IEC60332-2-2, UL2556/UL1581VW-1!

Note

The signal lines may not exceed a maximum length of 3 m!

2.4 Fuses

2.4.1 Fuses on the ES4455.2 Load Carrier Board

The fuses on the ES4455.2 Load Carrier Board are shown in Fig. 2-11.

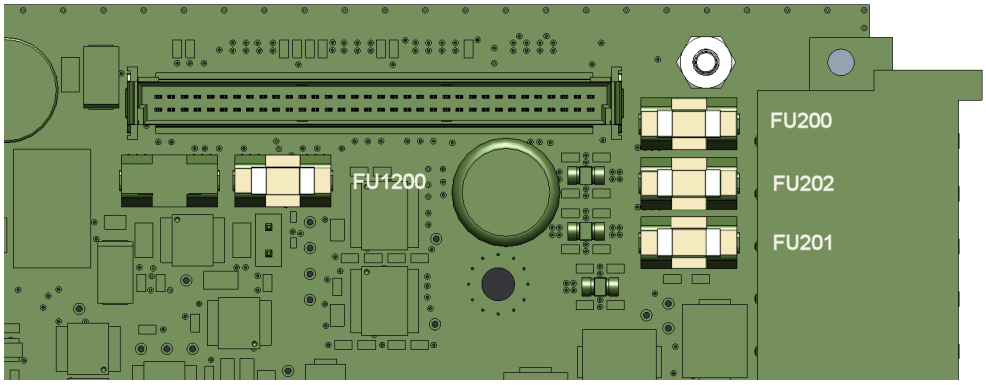

Fig. 2-11 Fuses on the ES4455.2 Load Carrier Board (marked bright)

Fuse	Type	Specification	Fuse protection of	Order no.
FU200	NANO2® Slo-Blo®Fuse 452/454 Series	T 1.5 A	+12VUF (+12 V)	154 01.5T
FU201	NANO2® Slo-Blo®Fuse 452/454 Series	T 0.75 A	+5VUF (+5 V)	0154.750T
FU202	NANO2® Slo-Blo®Fuse 452/454 Series	T 1.5 A	+3_3VUF (+3.3 V)	154 01.5T
FU1200	NANO2® Slo-Blo®Fuse 452/454 Series	T 2.0 A	Load module supply voltage	154 002T

Tab. 2-1 Fuses on the ES4455.2 Load Carrier Board

Note

These fuses are relevant for the ES4455.2 and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules.

2.4.2 Replacing Fuses on the ES4455.2 Load Carrier Board

The voltages listed in Tab. 2-1 on page 31 are protected with fuses. In case of a fuse defect, we recommend to send the board to ETAS for further testing. For this purpose, the device should be sent to ETAS (see "ETAS Contact Addresses" on page 51).

If a fuse trips multiple times, the device must be sent to ETAS.

If you should decide to replace a fuse yourself, the following warning notice and the installation instructions in "Removing and installing fuses on the ES4455.2 Load Carrier Board" on page 32 must be observed:

WARNING!

Fire hazard!
Failure to observe the fuse specifications can lead to excess currents, short circuits and fires.
Use only fuses that meet the specifications in Tab. 2-1 on page 31!
Never bridge defective fuses!

Removing and installing fuses on the ES4455.2 Load Carrier Board

The following instructions are described based on figures of the ES4457.1. They also apply to the variants ES4450.3, ES4451.4, ES4452.1, ES4453.1 and ES4458.1 mounted with load modules.

Note

The fuses on the ES4455.2 Load Carrier Board may be replaced only with the fuses specified in Tab. 2-1. The assignment is based on Fig. 2-11

1. Ensure that ESD-compliant conditions exist at your workplace.
2. Switch off the ES4408.1 Load Chassis and pull the power plug. Wait at least three minutes until the ES4455.2 Load Carrier Board has been discharged.

WARNING!

Danger from high voltages!
The components, plug connectors and conductor paths of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 may have dangerous voltages. These voltages can still be present even after the ES4455.2 and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 have been removed from the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing or if the ES4408.1 Load Chassis, the ES5300.1-A Housing or the ES5300.1-B Housing have been switched off.
Make sure that the products are protected from external contact during operation. Switch off the ES5300.1-A Housing, the ES5300.1-B Housing or the ES4408.1 Load Chassis and unplug from the mains. Wait at least three minutes before removing the products.
Failure to do so poses a danger to life and health.

3. Place the ES4450.3, ES4451.4, ES4452.1, ES4453.1,ES4457.1 or the ES4458.1 on its load side (see Fig. 2-12 on page 33).

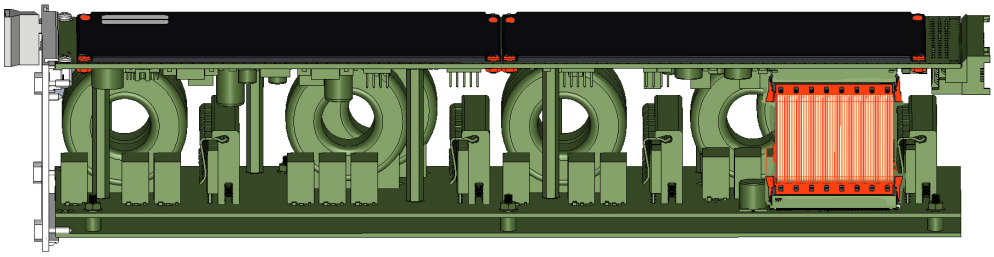

Fig. 2-12 Position of the ES4455.2 Load Carrier Board (top) with load module (bottom).

4. For the variants ES4452.1, ES4453.1,ES4457.1 and ES4458.1: Loosen the ribbon cable between the ES4455.2 Load Carrier Board and the load module.
5. Loosen the screws of the plastic cover with a PZ0 screwdriver while holding the screw nut underneath it with a hexagon drive of size 5 (see Fig. 2-12 on page 33).

Note

The screws are made of plastic. Carefully loosen the screws and carefully tighten them again during installation to avoid damaging them.

6. Remove the plastic covers.
7. Loosen the screws on the ES4455.2 Load Carrier Board with a T8 screwdriver (see Fig. 2-13 on page 33).

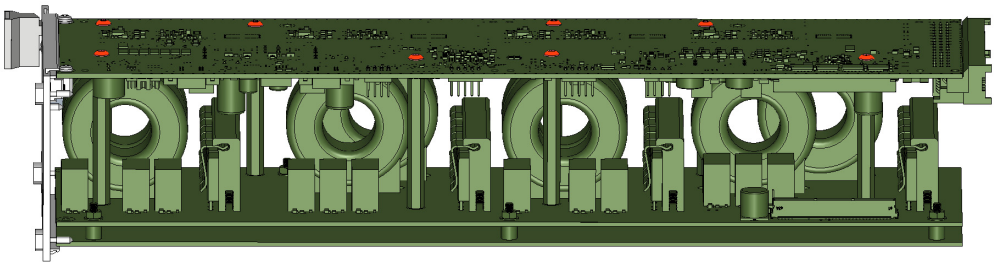

Fig. 2-13 ES4455.2 Load Carrier Board with load module after removing the plastic covers. The screws are marked in red.

8. Carefully lift the ES4455.2 Load Carrier Board and remove it.

Note

While removing the ES4455.2 Load Carrier Board, ensure that the printed circuits and the electronic components are not damaged by the spacer bolts between ES4455.2 Load Carrier Board and load module.

Note

Washers are located on the spacer bolts. Ensure that the washers are not getting lost. They are important for the electrical contact between the ES4455.2 Load Carrier Board and the load module.

9. Remove the defective fuses from the ES4455.2 Load Carrier Board with small pliers (ca. 2 mm wide) (see Fig. 2-11).
10. Install the new fuse according to Tab. 2-1 on page 31 and Fig. 2-11 on page 31.
11. Reinstall the ES4455.2 Load Carrier Board on the load module in reverse order. Observe the "Procedure for Installation and Removal" on page 28 for this purpose.

2.5 Interface for Load Modules on the ES4455.2 Load Carrier Board

The loads on the ES4455.2 Load Carrier Board are contacted via the spacer bolts. Access to the loads is implemented via the backplane connector CO200 (page 37) by the spacer bolts. Fig. 2-14 on page 34 shows the signal assignment of the contacts of the spacer bolts on the ES4455.2 Load Carrier Board.

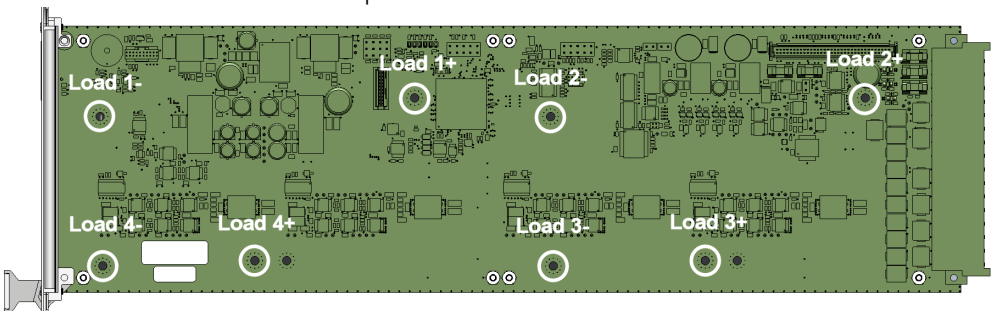

Fig. 2-14 ES4455.2 Load Carrier Board: Signal assignment for the loads.

2.6 Piezo Signal Generator

The ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules are equipped with a piezo signal generator.

At the start of an injection cycle, an acoustic signal is sound.

The acoustic signal can be activated or deactivated via LABCAR-OPERATOR.

2.7 Equivalent Circuit

An equivalent circuit for the loads is shown in Fig. 2-15.

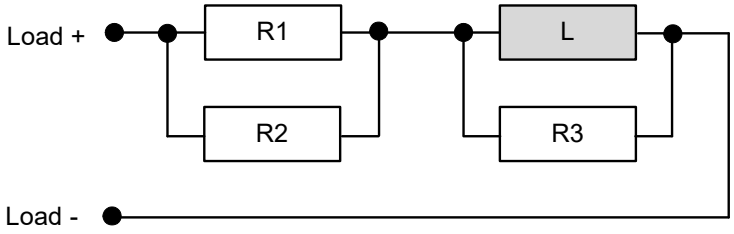

Fig. 2-15 Equivalent circuit for the load modules

The values for resistance and inductance at 20 °C are listed in Tab. 2-2.

Variant	Function		R1 | | R2 [Ω]	R3 [Ω]	L [µH]
ES4450.3	CRS	Diesel CRI2-x	0,22	n. c. (infinite)	180
ES4451.4	GDI	Gasoline HDEV5	1,65	68	1100
ES4452.1	CVO	Gasoline HDEV5	1,80	1000	1600
ES4453.1	CVO	Gasoline HDEV6	1,80	250	1300
ES4457.1	VCC	Diesel CRI2-x	0,70	n. c. (infinite)	240
ES4458.1	CVO	EV14	9,00	n. c. (infinite)	30000

Tab. 2-2 Resistance and inductance for the loads at 20 °C
Tolerance: 20%

3 Connections and Connectors

This chapter describes the connections of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 that are mounted with load modules.

3.1 Backplane Connector CO200 of the ES4455.2 Load Carrier Board

The ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules all have the same backplane connector:

Type: DIN41612_Type_F_MALE

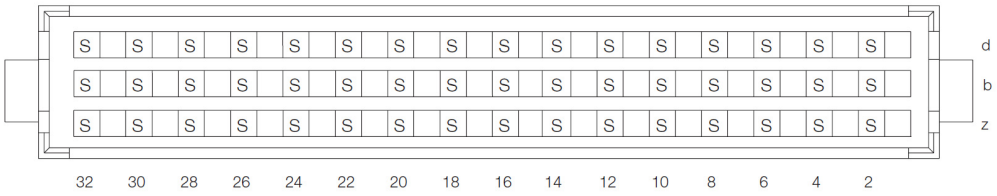

Fig. 3-1 Backplane connector CO200 of the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules.

Pin	Signal	Pin	Signal	Pin	Signal
z2	+12VUF	b2	GND	d2	n.c.
z4	+5VUF	b4	not connected	d4	+3_3VUF
z6	SPI_GTL_MISO	b6	SPI_GTL_MOSI	d6	SPI_GTL_CLK_R
z8	nCS0	b8	JTAG_TDI_CON	d8	JTAG_TDO_CON
z10	JTAG_TCK_CON_R	b10	JTAG_TMS_CON	d10	I_Dig_Out_1
z12	I_Dig_Out_2	b12	I_Dig_Out_3	d12	I_Dig_Out_4
z14	Online_Probe	b14	Online_Probe_GND	d14	n.c.
z16	n.c.	b16	I_Dig_Out_x_GND	d16	-UBAT_R
z18	Load 1+	b18	Load 1+	d18	Load 1+
z20	Load 1-	b20	Load 1-	d20	Load 1-
z22	Load 2+	b22	Load 2+	d22	Load 2+
z24	Load 2-	b24	Load 2-	d24	Load 2-
z26	Load 3+	b26	Load 3+	d26	Load 3+
z28	Load 3-	b28	Load 3-	d28	Load 3-
z30	Load 4+	b30	Load 4+	d30	Load 4+
z32	Load 4-	b32	Load 4-	d32	Load 4-

Tab. 3-1 "CO200" pin assignment

Reference Potentials

- I_Dig_Out_x_GND (b16): reference potential for I_Dig_Out_1,....4
- Online_Probe_GND (b14): reference potential for the loads Load 1,..4

3.2 Plug Connector CO1200 on ES4455.2, CO150 and CO100 on the Load Modules

The ES4455.2 Load Carrier Board is connected with the load modules of ES4452.1, ES4453.1, ES4457.1 and ES4458.1 via connector CO1200 and a ribbon cable. The connectors on the load modules ES4452.1, ES4453.1, ES4457.1 and ES4458.1 feature the same type (ES4452.1: CO150, ES4457.1: CO100)

Type: SMC-Q 68 M (order no. 244839)

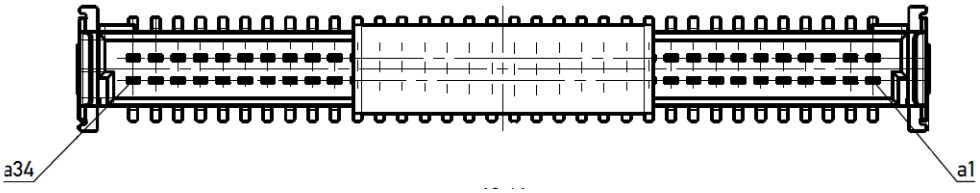

Fig. 3-2 Plug connector CO1200 on the ES4455.2 Load Carrier Board, CO150 on the load module of ES4452.1, ES4453.1, ES4458.1 and CO100 on the load module of ES4457.1

3.3 Connections and Plug Connections for Installation in the ES4408.1 Load Chassis

3.3.1 Plug Connectors "Load 7", " Load 8-1" and "Load 8-2"

The plug connectors "Load 7", "Load 8-1" and "Load 8-2" on the ES4408.1 Load Chassis allow connecting the load modules of the ES4455.2, ES4450.3, ES4451.4, ES4452.1, ES4453.1. ES4457.1 and the ES4458.1 to an ECU.

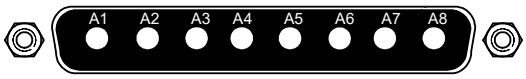

Fig. 3-3 Plug connectors "Load 7", " Load 8-1" and "Load 8-2"

Type: Hybrid DSUB 8W8 (male)

Counterplug: Hybrid DSUB 8W8 (female)

The plug connector "Load 7" enables access to the plug-in card in slot 2.

The pin assignment is as follows:

Pin	Signal	Backplane connection
A1	Load 1+	Slot 2:z18 Slot 2:b18 Slot 2:d18
A2	Load 1–	Slot 2:z20 Slot 2:b20 Slot 2:d20
A3	Load 2+	Slot 2:z22 Slot 2:b22 Slot 2:d22
A4	Load 2–	Slot 2:z24 Slot 2:b24 Slot 2:d24
A5	Load 3+	Slot 2:z26 Slot 2:b26 Slot 2:d26
A6	Load 3–	Slot 2:z28 Slot 2:b28 Slot 2:d28
A7	Load 4+	Slot 2:z30 Slot 2:b30 Slot 2:d30
A8	Load 4–	Slot 2:z32 Slot 2:b32 Slot 2:d32
Housing	ES4408 protective ground	

Tab. 3-2 "Load 7" pin assignment

The plug connector "Load 8-1" enables access to the plug-in card in slot 1.

The pin assignment is as follows:

Pin	Slot:Signal	Backplane connection
A1	Slot 1:Load 1+	Slot 1:z18 Slot 1:b18 Slot 1:d18
A2	Slot 1:Load 1–	Slot 1:z20 Slot 1:b20 Slot 1:d20
A3	Slot 1:Load 2+	Slot 1:z22 Slot 1:b22 Slot 1:d22
A4	Slot 1:Load 2–	Slot 1:z24 Slot 1:b24 Slot 1:d24
A5	Slot 1:Load 3+	Slot 1:z26 Slot 1:b26 Slot 1:d26
A6	Slot 1:Load 3–	Slot 1:z28 Slot 1:b28 Slot 1:d28
A7	Slot 1:Load 4+	Slot 1:z30 Slot 1:b30 Slot 1:d30
A8	Slot 1:Load 4–	Slot 1:z32 Slot 1:b32 Slot 1:d32
Housing	ES4408 protective ground	

Tab. 3-3 "Load 8-1" pin assignment

The plug connector "Load 8-2" enables access to the plug-in card in slot 0.

The pin assignment is as follows:

Pin	Slot:Signal	Backplane connection
A1	Slot 0:Load 1+	Slot 0:z18 Slot 0:b18 Slot 0:d18
A2	Slot 0:Load 1–	Slot 0:z20 Slot 0:b20 Slot 0:d20
A3	Slot 0:Load 2+	Slot 0:z22 Slot 0:b22 Slot 0:d22
A4	Slot 0:Load 2–	Slot 0:z24 Slot 0:b24 Slot 0:d24
A5	Slot 0:Load 3+	Slot 0:z26 Slot 0:b26 Slot 0:d26
A6	Slot 0:Load 3–	Slot 0:z28 Slot 0:b28 Slot 0:d28
A7	Slot 0:Load 4+	Slot 0:z30 Slot 0:b30 Slot 0:d30
A8	Slot 0:Load 4–	Slot 0:z32 Slot 0:b32 Slot 0:d32
Housing	ES4408 protective ground	

Tab. 3-4 "Load 8-2" pin assignment

3.3.2 Plug Connector "Meas 7", "Meas 8-1" and "Meas 8-2" on ES4408.1 Load Chassis

The plug-in cards ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules output measuring signals via the plug connectors "Meas 7", "Meas 8-1" and "Meas 8-2" of the ES4408.1 Load Chassis. These measuring signals are listed in the columns "Slot: Signal name" of Tab. 3-5, Tab. 3-6 and Tab. 3-7.

Type: DSUB 9-pin (female)

Counterplug: DSUB 9-pin (male)

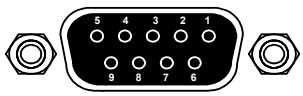

Fig. 3-4 Plug connectors "Meas 7", "Meas 8-1" and "Meas 8-2" on ES4408.1 Load Chassis

At plug connector "Meas 7", the measuring signals from the plug-in card located in slot 2 of the ES4408.1 Load Chassis (connected to "Load 7") are output.

The assignment of the connections of "Meas 7" with mounting of Slot_2 with ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 is as follows:

Connection:Pin	Slot: Signal name	Backplane connection ES4408.1
Meas 7:1	Slot2:I_Dig_Out_1	Slot 2:d10
Meas 7:2	Slot2:I_Dig_Out_2	Slot 2:z12
Meas 7:3	Slot2:I_Dig_Out_3	Slot 2:b12
Meas 7:4	Slot2:I_Dig_Out_4	Slot 2:d12
Meas 7:5	Slot2:Online_Probe	Slot 2:z14
Meas 7:6	Slot2:Online_Probe_Ref	Slot 2:b14
Meas 7:7	Slot2:not used	Slot 2:d14
Meas 7:8	Slot2:not used	Slot 2:z16
Meas 7:9	Slot2:GND	Slot 2:b16
Housing		

Tab. 3-5 "Meas 7" pin assignment

At plug connector "Meas 8-1", the measuring signals from the plug-in card located in slot 1 of the ES4408.1 Load Chassis (connected to "Load 8-1") are output.

The assignment of the connections of "Meas 8-1" with mounting of Slot_1 with ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 is as follows:

Connection:Pin	Slot: Signal name	Backplane connection ES4408.1
Meas 8-1:1	Slot1:I_Dig_Out_1	Slot 1:d10
Meas 8-1:2	Slot1:I_Dig_Out_2	Slot 1:z12
Meas 8-1:3	Slot1:I_Dig_Out_3	Slot 1:b12
Meas 8-1:4	Slot1:I_Dig_Out_4	Slot 1:d12
Meas 8-1:5	Slot1:Online_Probe	Slot 1:z14
Meas 8-1:6	Slot1:Online_Probe_Ref	Slot 1:b14
Meas 8-1:7	Slot1:not used	Slot 1:d14
Meas 8-1:8	Slot1:not used	Slot 1:z16
Meas 8-1:9	Slot1:GND	Slot 1:b16
Housing		

Tab. 3-6 "Meas 8-1" pin assignment

At plug connector "Meas 8-2", the measuring signals from the plug-in card located in slot 0 of the ES4408.1 Load Chassis (connected to "Load 8-2") are output.

The assignment of the connections of "Meas 8-2" with mounting of Slot_0 with ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 is as follows:

Connection:Pin	Slot: Signal name	Backplane connection ES4408.1
Meas 8-2:1	Slot0:I_Dig_Out_1	Slot 0:d10
Meas 8-2:2	Slot0:I_Dig_Out_2	Slot 0:z12
Meas 8-2:3	Slot0:I_Dig_Out_3	Slot 0:b12
Meas 8-2:4	Slot0:I_Dig_Out_4	Slot 0:d12
Meas 8-2:5	Slot0:Online_Probe	Slot 0:z14
Meas 8-2:6	Slot0:Online_Probe_Ref	Slot 0:b14
Meas 8-2:7	Slot0:not used	Slot 0:d14
Meas 8-2:8	Slot0:not used	Slot 0:z16
Meas 8-2:9	Slot0:GND	Slot 0:b16
Housing		

Tab. 3-7 "Meas 8-2" pin assignment

3.4 Connections and Plug Connections for Installation in the ES5300.1-A Housing or in the ES5300.1-B Housing

Installing the ES4455.2 Load Carrier Board and its variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 mounted with load modules in the ES5300.1-A Housing or the ES5300.1-B Housing requires the ES5372.1 Carrier for ES4455 Load Boards.

Tab. 3-9 on page 46 shows the backplane side of the ES5372.1 Carrier for ES4455 Load Boards. The plug connectors Load and Meas enable a connection of the Load Carrier Boards ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 to the motor ECU.

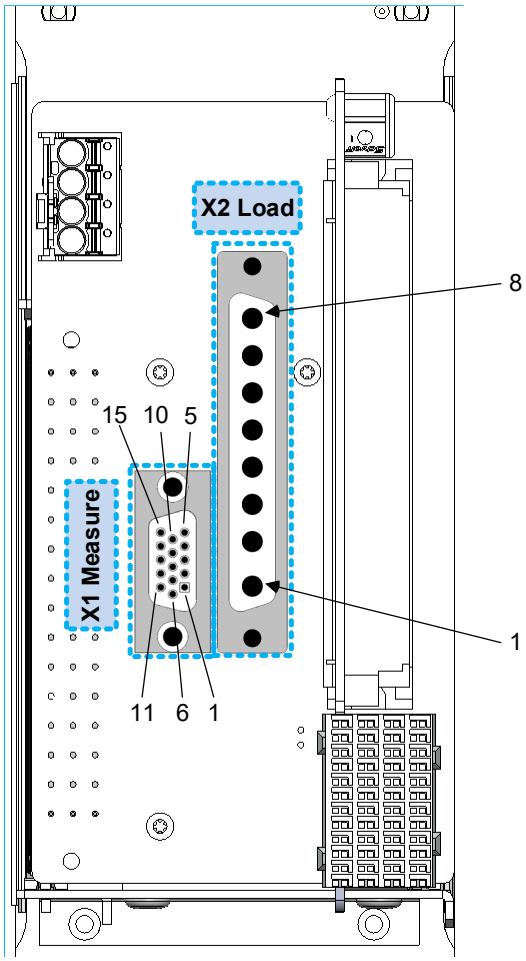

Fig. 3-5 Plug connectors "X1 Measure" and "X2 Load" on the backplane side of the ES5372.1 Carrier for ES4455 Load Boards.

3.4.1 "X2 Load" Plug Connector

Type: Hybrid-DSUB FM8W8P-5852 (male)
Manufacturer: FCT

Counterplug: Hybrid DSUB 8W8 (female)

The pin assignment of "X2 Load" is as follows:

Pin	Signal	CO 200
A1	Load 1+	z18 b18 d18
A2	Load 1–	z20 b20 d20
A3	Load 2+	z22 b22 d22
A4	Load 2–	z24 b24 d24
A5	Load 3+	z26 b26 d26
A6	Load 3–	z28 b28 d28
A7	Load 4+	z30 b30 d30
A8	Load 4–	z32 b32 d32
Housing		

Tab. 3-8 "X2 Load" pin assignment

3.4.2 "X1 Measure" Plug Connector

Type: HD15 pole (female)

Counterplug: HD15 pole (male)

The pin assignment of "X1 Measure" is as follows:

Connection:Pin	Signal Name	CO200
Meas 1	I_Dig_Out_1	d10
Meas 2	I_Dig_Out_2	z12
Meas 3	I_Dig_Out_3	b12
Meas 4	I_Dig_Out_4	d12
Meas 5	Online_Probe	z14
Meas 6	Online_Probe_Ref	b14
Meas 7	not used	d14
Meas 8	not used	z16
Meas 9	GND	b16
Housing		

Tab. 3-9 Pin assignment of "X1 Measure"

4 Technical Data and Standards

This chapter contains information about the technical data and standards of the products.

4.1 Technical Data

Load Channels Load 1 to Load 4

The following values apply to the plug connectors "Load 7", "Load 8-1" and "Load 8-2" for installation in the ES4408.1 Load Chassis or the "X2 Load" plug connector of the ES5372.1 for installation in the ES5300.1-A Housing or the ES5300.1-B Housing:

Number	4
Abs. max. load current	±20 A for max. 1 ms
Abs. max. load voltage per channel	±60 V DC for max. 1 ms
Abs. max. duty cycle	25%
Max. power	50 W rms (root mean square)

CAUTION!

The abs. max. load current, abs. max. load voltage, abs. max. duty cycle and maximum permissible power of 50 W rms must not be exceeded. If one or several of these values are exceeded, the injector load can be damaged, or an undefined behavior can occur (e.g. emergency shutdown of injector load).

Measurement Channels

The following values apply to the plug connectors " Meas 7", "Meas 8-1" and "Meas 8-2" of the ES5372.1 for installation in the ES4408.1 Load Chassis or the "X1 Measure" plug connector for installation in the ES5300.1-A Housing or the ES5300.1-B Housing:

Accuracy of current measurement - Level	±3%
Accuracy of current measurement - Timing	±2%
Electric strength of outputs	±60 V DC
Current rating of connections	1 A (60 V DC) per pin / back-plane channel

Storage Conditions

Temperature	-20 °C to 85 °C (-4 °F to 185 °F)
Relative humidity	0 to 95% (non-condensing)

Ambient Conditions

Environment	Use only inside enclosed and dry rooms
Max. contamination level	2
Temperature during operation	5 °C to 40 °C (41 °F to 104 °F)
Relative humidity	0 to 95% (non-condensing)
Operating altitude	max. 2000 m above see level

Power Supply

max. current consumption (mounted with load modules, full load operation)	+ 3.3 V DC: 100 mA + 5 V DC: 500 mA +12 V DC: 400 mA

Dimensions

Height	3 U
Width	14 HP
Depth	340 mm
Weight (ES4455.2)	0.5 kg
Weight (ES4450.3, ES4451.4, ES4452.1, ES4453.1 and ES4457.1)	4 kg
Weight (ES4458.1)	2 kg

4.2 Meets Norms and Standards

The products meet the following norms and standards:

Standard	**Test**
IEC 61326-1	Electrical equipment for measurement, control and laboratory use – EMC requirements (industrial setting)
IEC 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

The board is only intended for use in industrial settings in accordance with EN 61326-1. Avoid potential radio interference when using the module outside of the industrial settings with additional shielding measures!

WARNING!

This is class A equipment. This equipment can cause radio interference in residential areas. Should that be the case, the operator may be requested to institute reasonable measures.

Note

The signal lines may not exceed a maximum length of 3 m!

5 Ordering Data and Scope of Delivery

Order name	Short name	Order number
ES4455.2 Load Carrier Board	ES4455.2	F-00K-109-651
ES4450.3 Load Carrier Board for 4 RB CRS Injectors	ES4450.3	F-00K-109-653
ES4451.4 Load Carrier Board for 4 RB GDI Injectors	ES4451.4	F-00K-109-652
ES4452.1 Load Carrier Board for 4 RB GDI Injectors, CVO	ES4452.1	F-00K-109-654
ES4453.1 Load Carrier Board for 4 RB HDEV6 GDI Injectors, CVO	ES4453.1	F-00K-111-157
ES4457.1 Load Carrier Board for 4 RB CRS Injectors, VCC and VCA	ES4457.1	F-00K-109-655
ES4458.1 Load Carrier Board for 4 RB PFI Injectors, CVO	ES4458.1	F-00K-110-761
ES5372.1 Carrier for ES4455 Load Boards	ES5372.1	F-00K-109-682
Calibration Service for ES4450	K_ES4450	F-00K-106-174
Calibration Service for ES4451	K_ES4451	F-00K-104-597
Calibration Service for ES4452	K_ES4452	F-00K-110-242
Callibration Service for ES4453	K_ES4453	F-00K-111-158
Callibration Service for ES4455	K_ES4455	F-00K-106-386
Calibration Service for ES4457	K_ES4457	F-00K-110-243
Callibration Service for ES4458	K_ES4458	F-00K-110-763

The scope of delivery for ES4455.2 Load Carrier Board and the variants ES4450.3, ES4451.4, ES4452.1, ES4453.1, ES4457.1 and ES4458.1 is as follows:

Scope of delivery	Number of pieces	Order number
The respective board	1	See table above
Additionally for ES5372.1	See ES5372.1 User's Guide	See ES5372.1 User's Guide

6 ETAS Contact Addresses

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Germany WWW: www.etas.com

ETAS Subsidiaries and Technical Support

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

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

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