

AVL



FAST TRACK TO SKILLS.

## AVL Remote Training Catalog

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## FAST TRACK TO SKILLS

Experience the new **AVL Skills Center Remote Training Portfolio**. This is especially relevant in view of current restrictions related to mobility and while testing laboratories and development departments might be less occupied.

We are offering fully fledged live technical training sessions including the use of relevant equipment (e.g. simulators) for the participants.

In this catalog you will find all our trainings that are currently conducted remotely and dedicated to a single customer organization. The date is agreed individually with the customer.

Some of these trainings are also available as “Open Training or Seminars”. These training courses and seminars are open for participants from various companies and are carried out on fixed dates. You only pay for the trainee participating, not the entire training class. This allows you to keep training costs down. Look out for the following labels:

**Also available as Open Training – ONE SEAT**

**Also available as Open Seminar – ONE SEAT**

You find an overview of our remote open training offering on the last page of the catalog. For the entire training portfolio including our face-to-face standard training courses please explore [AVL eShop™](#).

In case of any questions you're welcome to contact us at [skillscenter@avl.com](mailto:skillscenter@avl.com).

Set out to achieve fast track to skills - our offering is constantly expanding!

Your AVL Skills Center Team

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# 1. TRAINING FOR TESTBED SYSTEMS

## 1.1. REM.TRAIN. PUMA ENGINE TESTBED

TTRPUMAENG.01

### REMOTE TRAINING – OPERATION & PARAMETERIZATION OF PUMA ENGINE TESTBED

This training refers to PUMA versions 1.5.3 and 2 – for a training dealing with older versions, please contact your local representative.

#### Target Group

Operation (Test Operator), Parameterization (Test Engineer)

#### Target

The participants are able to operate the PUMA Engine testbed automation system. Furthermore, the trainees are able to modify the parameters regarding the main automation system tasks for controlling, measurement and monitoring. Additionally, they know the main tools to perform automatic testruns.

#### The training includes:

- 8 sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

#### Content

- Testbed Operating
  - Starting the PUMA system
  - PUMA operating steps and operator interface
  - Control of UUT and dyno
    - Control modes and demand values
    - Operating with panel, manual operation window and automatic mode
  - Monitoring
    - Handling of testbed and limit monitoring
  - Measurement
    - Operation of stationary and recorder measurement
    - Simple data evaluation with AVL CONCERTO
- PUMA Parameterization
  - Parameterization tools – the navigator
  - Parameter set overview and handling
  - Data acquisition and quantities in general
  - Measurement
    - Parameterization of steady state and recorder measurement
  - UUT Control
    - Overview of main UUT parameters (max. speed, start, stop...)
    - Overview of main UUT set values and controllers (ALPHA, TORQUE, SPEED)
  - Monitoring
    - Parameterization of testbed monitoring, limit monitoring and the post mortem recorder
  - Formulas
    - Parameters and functions of cyclic and on demand formulas in PUMA
  - Automatic testrun
    - Overview of main tools for program flow control and Dyno/UUT control
    - Parameterization of simple automatic testruns

#### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of the operation an unit under test

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – OPERATION & PARAMETERIZATION OF PUMA E-MOTOR TESTBED**

This training refers to PUMA versions 1.5.3 and 2 – for a training dealing with older versions, please contact your local representative.

Target Group

Operation (Test Operator), Parameterization (Test Engineer)

Target

The participants are able to operate the PUMA E-Motor testbed automation system. Furthermore, the trainees can modify the parameters regarding the main automation system tasks for controlling, measurement and monitoring. Additionally, they know the main tools to perform automatic testruns.

The training includes:

- 8 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Testbed Operating
  - Start the PUMA system
  - PUMA operating steps and operator Interface
  - Control of AVL E-Storage System, UUT and dyno
    - o Operation and main states of the AVL E-STORAGE system
    - o Control modes and demand values
    - o Operating with panel, manual operation window and in automatic mode
  - Monitoring
    - o Handling of testbed and limit monitoring
  - Measurement
    - o Operation of stationary and recorder measurement
    - o Simple data evaluation with AVL CONCERTO
- PUMA parameterization
  - Parameterization tools – the navigator
  - Parameter set overview and handling
  - Data acquisition and quantities in general
  - Measurement
    - o Parameterization of steady state and recorder measurement
  - UUT Control
    - o Overview of main UUT parameters (max. speed, start, stop...)
    - o E-Motor Torque Controller (only in case of version PUMA 2 E-Motor)
  - Monitoring
    - o Parameterization of testbed monitoring, limit monitoring and the post mortem recorder
  - Formulas
    - o Parameters and functions of cyclic and on demand formulas in PUMA
  - Automatic test run
    - o Overview of main tools for program flow control and Dyno/UUT control
    - o Parameterization of simple automatic test runs

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- Training regarding „E-STORAGE SYSTEM” will be performed on operator level in this training. Detailed training regarding „E-STORAGE SYSTEM” is not part of supply.
- If an AVL e-Power measurement system is installed at the testbed we recommend to order the "TRAINING HW E-POWER MEASUREMENT SYSTEM" (TTEPOWEROP.01) in addition.

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**



**REMOTE TRAINING – OPERATION & PARAMETERIZATION OF PUMA HYBRID ENGINE TESTBED**

This training refers to PUMA versions 1.5.3 and 2 – for a training dealing with older versions, please contact your local representative)

Target Group

Operation (Test Operator), Parameterization (Test Engineer)

Target

The participants are able to operate the PUMA Hybrid Engine testbed automation system. Furthermore, the trainees can modify the parameters regarding the main automation system tasks for controlling, measurement and monitoring. Additionally, they know the main tools to perform automatic testruns.

The training includes:

- 8 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Testbed Operating
  - Start the PUMA system
  - PUMA operating steps and operator Interface
  - PUMA hybrid control strategy
  - Operation and main states of the AVL E-STORAGE system
  - Operating with panel, manual operation window and in automatic mode
  - Handling of testbed and limit monitoring
  - Operation of stationary and recorder measurement
  - Simple data evaluation with AVL CONCERTO
- PUMA parameterization
  - Parameterization tools – the navigator
  - Parameter set overview and handling
  - Data acquisition and quantities in general
  - Parameterization of steady state and recorder measurement
  - Overview of main UUT parameters (max. speed, start, stop...)
  - Demand value to the HCU
  - Parameterization of testbed monitoring, limit monitoring and the post mortem recorder
  - Parameters and functions of formulas in PUMA
  - Overview of main tools for program flow control and Dyno/UUT control
  - Parameterization of simple automatic test runs

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – PUMA 2 FUEL CELL – FUEL CELL SYSTEM TESTING**Target Group

Operation (Test Operator), Parameterization (Test Engineer)

Target

The participants are able to operate the AVL PUMA 2 Fuel Cell System testbed automation system. The trainees are able to run a Fuel Cell System, define and execute manual measurements, perform automatic test runs and modify testbed parameters in general.

The training includes:

- 8 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Basic functions and architecture of a Fuel Cell Systems testbed
- Testbed Operating
  - Starting the automation system and PUMA application programs
  - Control structure and control modes of the testbed
  - Manual and automatic operation of the unit under test
  - Testbed monitoring
  - Limit monitoring
  - General data acquisition on the testbed
  - Definition and execution of manual measurements
  - Data online display and basic data evaluation with AVL CONCERTO
- PUMA parameterization
  - Parameterization tools – the navigator
  - Parameter set overview and handling
  - Data acquisition and quantities in general
  - Parameterization of steady state and recorder measurement
  - Overview of UUT parameters
  - Basic Parameterization of a test cell controller
  - Overview of the test cell controller for UUT and Load Unit
  - Parameterization of testbed monitoring, limit monitoring and the post mortem recorder
  - Parameters and functions of formulas in PUMA
  - Overview of main tools for program flow control and Dyno/UUT control
  - Parameterization of simple automatic test runs

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

## 2. TRAINING FOR MONITORING, CONTROL AND SIMULATION

### 2.1. REM.TRAIN. EMCON 400

TTREMCO400.01

#### REMOTE TRAINING – OPERATION AND PARAMETERIZATION OF EMCON 400

This training refers to EMCON versions 5.4.3 and 6.R.x – for a training dealing with older versions, please contact your local representative

##### Target Group

Parameterization (Test Engineer), Maintenance & Service (Calibration / Maintenance / Service Personnel)

##### Target

The participants are able to operate the EMCON 400 via menus on the operating panel. In addition they know the principal system architecture and the parameterization of the EMCON system. The participants integrate EMCON 400 I/O components into the system.

##### The training includes:

- 8 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

##### Content

- Hardware overview
- PUMA – EMCON integration, Engine and Dyno Interfaces
- Discussing the EMCON parameter with practical examples
- Modification of the EMCON parameter to extend EMCON functions
- Connection possibilities and hardware environment (example F-FEM-CON, ETC-FEM-FIO)
- Basic explanation of engine and dynamometer controllers for stationary purposes
- Demand value setting with operating panel or PUMA automation system
- Parameter menu
- Parameter blocks
- Safety concept

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Experience in operation and parameterization of the PUMA Open System

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – OPERATION TESTBED CONTROLLER (STAND ALONE ADVANCED)**

This training refers to version EMCON 6.

Target Group

Operation (Test Operator), Parameterization (Test Engineer), Maintenance & Service (Calibration / Maintenance / Service Personnel)

Target

The participants are able to operate the Testbed Controller. They understand and the principal functions of the Testbed Controller and are able to adjust the engine-dyno controllers.

The training includes:

- 6 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Hardware system overview
- Connection possibilities and hardware environment
- Dyno Interface
- Explanation of the Testbed Controller by means of practical examples
- Adjustment of engine and dynamometer controllers for stationary purposes
- Operation of the Testbed Controller via operating panel
- Parameter menu
- Recall mode

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

## 3. TRAINING FOR TESTBED AUTOMATION

### 3.1. REM.TRAIN. PUMA TESTRUN PREPARATION

TTRPUMATRP.01

#### REMOTE TRAINING – DEVELOPMENT OF AUTOMATIC TESTRUNS IN PUMA

This training covers the creation of automatic testruns in the PUMA automation system of version 1.5.3 or 2. For a training dealing with older versions, please contact your local representative.

##### Target Group

Parameterization (Test Engineer)

##### Target

The participants can parameterize automatic test runs according to complex test requirements and display the results.

##### The training includes:

- 6 sessions (3-hour block each), date and time schedule to be agreed
- Training material
- AVL certificate for participants

##### Content

- Functions and tools
  - General functions like cut / copy / paste ..., search, compare
  - Quantities versus local variables
  - Link status, import functions and version handling
- BSQ (Block SeQuences)
  - General properties (timing) and program flow elements
  - Operator interface commands and online window (debugging)
  - Structural elements (group, subroutine, exception)
- SSQ (Step SeQuences)
  - SSQ demand value definition, properties of steady state and dynamic SSQ
  - Step buffer handling, export/import example
- Recorder
- Steady State Measurement
- Exception Handling
  - Exception types, definition of exception handlers, remind / recover
- Library Handling
  - Purpose and overview
  - Functions and tools
- Creation of a complex automatic testrun example

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

## REMOTE TRAINING – DEVELOPMENT OF VB SCRIPTS IN PUMA

This training covers the development and integration of VB scripts into the PUMA automation system version 1.5.3 or 2. For a training dealing with older versions, please contact your local representative.

### Target Group

Parameterization (Test Engineer)

### Target

The participants understand the basic usage of scripting in PUMA (Activation Objects, Scripting, Extensibility Scripts, State Machine and BSQ/SSQ). They can create, modify and test the scripts in the PUMA system.

### The training includes:

- 8 Sessions (3-hour block each), date and time schedule to be agreed
- Training material
- AVL certificate for participants

### Content

- Introduction into the VB programming language
- VB script syntax and best practices
- VB concepts: variables, constants and control structures
- VB concepts: functions, subroutines, data arrays
- Basic introduction into scripting in PUMA
- Creation and modification of script contexts
- Definition of hand-over parameters (system channels / script parameters)
- Integration of scripts into the automatic testrun (BSQ/SSQ)
- Execution of scripts from other PUMA components
- Practical exercises using extensibility scripts
- Debugging and problem analysis

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended.
- It is necessary to have basic knowledge in programming languages e.g. C++, VBA, VBS and to understand the fundamental concepts of those, e.g. functions/subroutines, hand-over of parameters by reference and by value, indexed data types
- Experience in operation and parameterization of the PUMA System
- Knowledge of creating automatic test runs with BSQ / SSQ

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – SETUP & PROGRAMMING TEST CELL CONTROL (TCC)**

This training covers design and development of the TCC in the PUMA versions 1.5.3 and 2. For a training dealing with older versions, please contact your local representative.

Target Group

Parameterization (Test Engineer)

Target

The participants can define and test the programmable test cell control according to their requirements.

The training includes:

- 4 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Function of the Automation System Controller (ASC)
  - Editing Extensibility scripts
- Functions of the Test Cell Control (TCC)
  - States
  - Actions
  - Triggers
- PUMA application examples with ASC and TCC

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, webcam and 2nd monitor recommended
- Experience in operation and parameterization of the PUMA System
- Basic knowledge about VB Scripts

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – PARAMETERIZATION AND TROUBLESHOOTING FOR PROFIBUS & PROFINET**Target Group

Operator, Parameterization & Test Engineer

Target

The participants are able to build up a Profibus / Profinet network themselves and carry out parameterization.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Profibus basics
- Technical Data
- Bitrates and cabling
- Working with SYCON and SYCON.net
- PUMA Parameterization
- Practical exercise on Remote Simulator

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- PUMA Basic knowledge
- “REMOTE SEMINAR PUMA IO INTERFACES” (TTRPUMAIOI.01)

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee



**REMOTE TRAINING – PARAMETERIZATION AND TROUBLESHOOTING FOR A2CAN AND CANOPEN**Target Group

Operator, Parameterization & Test Engineer

Target

The participants are able to understand the structure of CAN-Bus, to set it up and to parameterise it in the PUMA software.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Basics of the CAN-Bus
- Technical Data
- Bitrates and cabling
- CAN-Signals and Messages
- Creation and modification of a DBC file
- Basics of the CANopen Pressure Transducers
- Practical exercise on Remote Simulator

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- PUMA Basic knowledge
- “REMOTE SEMINAR PUMA IO INTERFACES” (TTRPUMAIOI.01)

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

## REMOTE TRAINING – OPERATION & PARAMETERIZATION OF ISAC 400

This training refers to PUMA versions 1.5.3 and 2 – for a training dealing with older versions, please contact your local representative.

### Target Group

Operation (Test Operator), Parameterization (Test Engineer)

### Target

The participants are able to parameterize and operate the dynamic testbed. They are able to execute and adjust the parameters to pass statutory dynamic test profiles, parameterize various vehicles, different road load definitions and different drivers.

### The training includes:

- 8 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Basic model of vehicle and driver simulation
- Parameterization of a vehicle and road-load definition
- Adjustment of the driver
- Operation of the dynamic testbed
- Creation of dynamic sequences
- Optimization of gear shifts and controllers according to legal cycles

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – PARAMETERIZATION & OPERATION OF ISAC 40Y - POWERTRAIN TESTBED**

This training refers to Version PUMA 2 and EMCON version 6.R.x – for a training dealing with older versions, please contact your local representative

Target Group

Operation (Test Operator), Parameterization (Test Engineer)

Target

The participants are able to parameterize and operate the dynamic Powertrain testbed. In addition the trainees are able to define dynamic test sequences, create several types of drivers and set up the requested vehicle according to specific data.

The training includes:

- 6 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Basic vehicle and driver simulation model for the powertrain configuration
- Parameterization of a vehicle with several drivers
- ISAC 40y controller structure for one customer configuration (e.g. 402 or 404)
- Operation of the dynamic testbed
- Creation of dynamic sequences
- Optimization of gear shifts and controllers according to legal cycles
- Simulation of driving sequences

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- All the course content is with respect to the specific customer configuration and deals with one out of the four possible configurations

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- PUMA knowledge (basics) recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

## REMOTE TRAINING – IGEM 2 BASICS

Scope of the iGEM application, legislation requirements and cycles, software structure. Configuration for different applications and for different testing environments (LD, HD, NRMM, SORE, engine or chassis dyno).

### Target Group

Operation (Test Operator, Test Engineer)

### Target

The participants understand the function of AVL iGEM 2 and are able to operate the test bed-automation system. The meaning of “pretest dialog values” is known and AVL iGEM 2 test runs can be executed. Additionally, they are able to evaluate test results with CONCERTO and create test specific reports.

### The training includes:

- 5 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Combustion process
  - Combustion and emissions
  - Aftertreatment systems
- Emission legislation requirements and basic calculation
  - Differences between different applications (Light Duty, Heavy Duty, NRMM, SORE)
  - Specific grams calculation example
- Emission measurement devices overview
- iGEM 2 Structure
  - Parameters
  - Data Base
  - Results
- Operating with the system
  - Selection of test cycle, test limits and parameterization of iGEM 2 Pre Test Dialog
- Generating a test result report
  - Access to results via CONCERTO
  - Generate report with EMA working environment in CONCERTO
  - Understanding the report contents

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- Training of customer specific functions can only be provided using the actual customer system

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- PUMA 2 knowledge (Operator level)
- Experience in emission testing (engine test cell and/or chassis dyno)

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

## REMOTE TRAINING – iGEM 2 VEHICLE INSTALLATION AND PARAMETERIZATION

Installation of iGEM 2 on an already installed PUMA 2 system. Commissioning of parameters, execution of emission cycle, generation of test report, customizations.

### Target Group

Testbed Engineer

### Target

The participants are able to understand how the system works, to configure and parametrize it, to keep it efficient and operational. They know how to make small adjustments if necessary. Furthermore they are able to generate the test report and find the root cause of possible errors.

### The training includes:

- 5 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Installation on iGEM 2
  - iGEM 2 packages and EMA license
- Parameterization of iGEM 2
  - System parameter (EBH, MDV, CHM blocks)
  - Unit Under Test parameter
  - Test Run Parameter (BSQ)
  - Test Facility parameter
  - Drivers Aid (IDA)
  - Mapping
- Emission Cycle Structure
  - BSQ structure (EMA Chassis.tst)
  - ELD and ECD structure
  - ECD and ELD modification
  - Devices handling
  - Customization of Recorder
- Generating a test result report
  - Generate report with EMA working environment in CONCERTO
  - Report troubleshooting
  - Customization of report

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- Training of customer specific functions can only be provided using the actual customer system

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- PUMA 2 knowledge (Operator level)
- iGEM 2 Basics
- Experience in emission testing (chassis dyno)

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – IGEM 2 ENGINE HD INSTALLATION AND PARAMETERIZATION**

Installation of iGEM 2 on an existing PUMA 2 system. Commissioning of parameters, execution of emission cycle, generation of test result report, customizations.

Target Group

Testbed Engineer

Target

The participants are able to understand how the system works, to configure and parametrize it, to keep it efficient and running. They know how to modify or change something when required. Furthermore they are able to generate the result report and find the root cause of possible errors.

The training includes:

- 5 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Installation on iGEM 2
  - iGEM 2 packages and EMA license
  - File and folder deployed
- Parameterization of iGEM 2
  - System parameter (EBH, MDV, CHM blocks)
  - Unit Under Test parameter
  - Test Run Parameter (BSQ)
  - Test Facility parameter
  - Mapping
- Emission Cycle Structure
  - BSQ structure (EMA Engine.tst)
  - ELD and ECD structure
  - ECD and ELD modification
  - Devices handling
  - Customization of Recorder
- Generating a test result report
  - Generate report with EMA working environment in CONCERTO
  - Report troubleshooting
  - Customization of report

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- Training of customer specific functions can only be provided using the actual customer system

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- PUMA 2 knowledge (Operator level)
- "REMOTE TRAINING iGEM 2 BASICS" (TTRIGEM2BA.01)
- Experience in emission testing (engine test cell and/or chassis dyno)

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

## REMOTE TRAINING – FROM DATA SOURCE TO REPORT WITH CONCERTO

This training refers to all AVL CONCERTO 5 releases – for a training dealing with older versions, please contact your local representative.

### Target Group

Operation (Test Operator), Data Evaluation (Post Processing personnel)

### Target

The participants are able to handle the complete post-processing workflow with AVL CONCERTO from data import to visualization and evaluation.

### The training includes:

- 4 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Overview of the data structure and data management
- Import of test result data from a wide variety of sources (for example: AVL PUMA, ETAS INCA, AVL iFiles, CSV, etc.)
- Creation of diagrams, tables and reports
- Evaluation and interpretation of measurement data
- Data comparison (of test results from the same data source)
- Exporting and merging of data
- Management of layouts and data sources in work environments and libraries
- Hands-on exercises with application examples for above topics

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- **CONCERTO Licenses for Installation on customer PC/Laptop can be provided but must be requested prior to training start**

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**



## REMOTE TRAINING – AUTOMATIC DATA PROCESSING WITH CONCERTO

This training refers to all AVL CONCERTO 5 releases – for a training dealing with older versions, please contact your local representative.

### Target Group

Data Evaluation (Post Processing personnel with established CONCERTO experience), Data Post Processing.

### Target

The participants are able to design and implement advanced post-processing applications using AVL CONCERTO. This includes development of formulae/macros/scripts to extend the basic CONCERTO functionality and to automate large post processing tasks and create a GUI to guide operators through complex evaluation processes.

### The training includes:

- 4 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Creation of CONCERTO formulae, macros and scripts
  - Resource management
  - Organization of CONCERTO components in multi user environments
  - Library concept
  - Advanced data source configuration
- Application development
  - Data handling (resampling, extracting, filtering, etc.)
  - Creation of GUI
  - Automation of work flows
  - Data export
- Hands-on exercises with application examples for above topics

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- TRAINING CONCERTO EVALUATION” or equivalent knowledge  
“TRAINING CONCERTO EVALUATION” (TT03AD001A.01)
- **CONCERTO Licenses for Installation on customer PC/Laptop can be provided but must be requested prior to training start**

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

## REMOTE WORKSHOP – PYTHON IN AVL CONCERTO

This training refers to all AVL CONCERTO 5 R3 releases and newer.

### Target Group

Data Evaluation Engineers with knowledge in Python. Experienced CONCERTO App Developer

### Target

The participants understand how Python functions can be embedded in CONCERTO post processing applications. Practical examples should highlight the advantages of Python over CONCERTO scripting language.

### The training includes:

- 4 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Introduction / Overview of the Python implementation
- Data transfer between CONCERTO / Python
- Data structures in Python
- Calculations / Automation with Python
- Comparison to existing CONCERTO scripting functionality
- Hands-on exercises with application examples for above topics

### Notes

- Training class is conducted in English
- Max. participants: 6 persons

### Prerequisites

- Remote training via Web-Services: Stable internet connection required
- Headset, Webcam and 2nd screen recommended
- “TRAINING CONCERTO ADVANCED” (TT03AD002A.01) or equivalent knowledge
- Basic skills with Python are mandatory, this is NOT a training for Python coding
- **CONCERTO licenses for Installation on customer PC/Laptop can be provided but must be requested prior to training start**

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

## 4. TRAINING FOR TEST INFORMATION MANAGEMENT

### 4.1. REM.TRAIN. AVL PUMA 2 SHARE

TTRPUMA2SH.01

#### REMOTE TRAINING – ADMINISTRATION & MAINTENANCE OF PUMA 2 SHARE (formerly Santorin HOST)

This training refers to PUMA 2 Share (formerly Santorin HOST 5.5) or above. For a training dealing with older versions, please contact your local representative.

##### Target Group

Test Field Administrator, IT Administrator

##### Target

The participants are able to administrate and parameterize a PUMA 2 Share system according to test field requirements and are also able to carry out necessary maintenance task to ensure data security/safety

##### The training includes:

- 8 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

##### Content

- System design / Test field set up
- Administration
  - PUMA quantities
  - Projects
  - Users
  - Database (STORM)
- Parameterization via AVL Navigator
- Functions
  - Result replication
  - Weather station
  - Tables (Central/Master-Data)
  - Test field data distribution (TFDD)
- Automation of administrative tasks
  - Email Distributor (EMD)
  - AutoProc
- Archiving
- DataBridge
- AVL Santorin Backup

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- Training on/with customer's server is subject to clarification before training. If remote connection is not possible the training will be held on generic server simulators provided by AVL Skills Center

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

## 5. TRAINING FOR CONSUMPTION MEASUREMENT

### 5.1. REM.TRAIN. FUEL EXACT MF PLU

TTRFEMFPLU.01

#### REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT FUEL EXACT MASS FLOW AND FUEL EXACT PLU

This training refers to Fuel Exact MF and Fuel Exact PLU (AVL 740).

##### Target Group

Operation (Test Operator), Maintenance & Service (Maintenance / Service personnel)

##### Target

The participants are able to operate the AVL Fuel Exact MF and Fuel Exact PLU, to perform measurements and to carry out simple maintenance.

##### The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

##### Content

###### Session 1:

- Basic knowledge of fuel measurement and conditioning
- Overview of system set-up. Installation, important parameters and options
- Operation of the devices
  - Measurement principle and pre-requisites, operating states and functions

###### Session 2:

- Maintenance
  - Maintenance of filters and valves
  - Venting of the system, zero consumption measurement
  - Leak check, check the safety system
  - Check the temperature control system

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT FUELSYSTEM PLU PLUTRON**

This training refers to Fuelsystem PLU and Fuelsystem PLUton (AVL 720).

Target Group

Operation (Test Operator), Maintenance & Service (Maintenance / Service personnel)

Target

The participants are able to operate the AVL Fuelsystem PLU and Fuelsystem PLUtron to perform measurements and to carry out simple maintenance.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Basic knowledge of fuel measurement and conditioning
- Overview of system set-up. Installation, important parameters and options
- Operation of the devices
  - Measurement principle and pre-requisites, operating states and functions

## Session 2:

- Maintenance
  - Maintenance of filters and valves
  - Venting of the system, zero consumption measurement
  - Leak check, check the safety system
  - Check the temperature control system

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – OPERATION & BASIC MAINTENANCE FUEL MASS FLOW TEMPERATURE CONTROL**

This training refers to Fuel Mass Flow and Fuel Temperature Control (AVL 735S / 753C).

Target Group

Operation (Test Operator), Maintenance & Service (Maintenance / Service personnel)

Target

The participants are able to operate the AVL Fuel Mass Flow and Fuel Temperature Control to perform measurements and to carry out simple maintenance.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Basic knowledge of fuel measurement and conditioning
- Overview of system set-up. Installation, important parameters and options
- Operation of the devices
  - Measurement principle and pre-requisites, operating states and functions

## Session 2:

- Maintenance
  - Maintenance of filters and valves
  - Venting of the system, zero consumption measurement
  - Leak check, check the safety system
  - Check the temperature control system

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT FUEL REFERENCE MASS FLOW AND PLU**

This training refers to Fuel Reference MF and Fuel Reference PLU.

Target Group

Maintenance & Service (Maintenance / Service personnel)

Target

The participants are able to operate the AVL Fuel Reference MF and Fuel Reference PLU, to carry out calibrations and to perform simple maintenance.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Basic knowledge of fuel measurement and conditioning
- Overview of system set-up. Installation, important parameters and options
- Operation of the devices
  - Measurement principle and pre-requisites, operating states and functions

## Session 2:

- Calibration
  - Preparation for calibration
  - Zero consumption measurement, leak check, check the temperature control system
  - Execute the calibration
  - Postprocessing, documentation

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

## 6. TRAINING FOR EMISSION ANALYSIS AND MEASUREMENT

### 6.1. REM.TRAIN. MICRO SOOT SENSOR PLUS

TTRMSSPLUS.01

#### REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT MICRO SOOT SENSOR PLUS (AVL 483)

This training refers to Micro Soot Sensor Plus.

##### Target Group

Operation (Test Operator), Maintenance & Service (Calibration / Maintenance / Service personnel)

##### Target

The participants are able to operate the AVL Micro Soot Sensor, to perform measurements and to carry out simple maintenance.

##### The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

##### Content

###### Session 1:

- Basic knowledge of emissions measurement
- Overview of system set-up. Installation, important parameters and options
- Operation the Micro Soot Sensor Plus
  - Measurement principle and procedures, operating states and functions, controlling

###### Session 2:

- Maintenance
  - Cleaning windows, measuring cell, sampling lines, changing the filter elements, cleaning dilution cell and high pressure option
  - Calibration check, laser / microphone linearity check and automatic checks, temperature reference measurement
  - Leak check (internal & external) and leak detection
  - Service & measurement data logging – fingerprint (helpline report)

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee



**REMOTE TRAINING – MICRO SOOT SENSOR 2 (MSS 2 – AVL 497)**Target Group

Testbed Engineers / Leaders, Technicians in Sales, Service, Commissioning, Engineering and Development

Target

The participants know the features of the MSS 2 (AVL 497) including operation, checks and regular maintenance work and integration of options (like PSU, EPU, M.O.V.E) and accessories.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Theoretical part – introduction
  - Basic knowledge of emissions measurement
  - Overview of system set-up. Installation, important parameters and options
  - Measurement principle, features / specifications and MSS 2 concept with advantages in the testbed and for RDE applications
- Sensor and base unit components, pneumatics
- Communication and boards
- Operating states and functions of the MSS 2

## Session 2:

- Verifications, (automatic) checks and relative calibration, temperature reference measurements
- Maintenance
  - Cleaning windows, measuring cell, sampling lines, changing the filter elements, cleaning dilution cell and high-pressure option
  - Leak check and leak detection
  - Service & measurement data logging – helpline report

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – UPGRADE TO MICRO SOOT SENSOR 2 – MSS 2 (AVL 497)**

Operation & basic maintenance at Micro Soot Sensor 2.

Target Group

Operation (Test Operator), Maintenance (Calibration / Maintenance / Service / Commissioning personnel)

Target

The participants know the differences to the MSS Plus and are able to operate the AVL Micro Soot Sensor MSS 2, to perform measurements and to carry out basic service and maintenance.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Repeating measuring principles and functionality of the Micro Soot Sensor
- Differences MSS Plus to the MSS 2, installation and overview of system set-up
  - Operating the MSS 2 via PC (Device Control Software) and PUMA system, operating states and functions, important parameters and features, data quality and correlation

## Session 2:

- MSS 2 range of applications
- MSS 2 options (RDE)
- Maintenance with focus on differences MSS Plus to the MSS 2

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge
- Basis knowledge of Micro Soot Sensor Plus preferable

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT PARTICLE COUNTER (AVL 489)**

Training for AVL Particle Counter, APC Advanced, APC<sup>plus</sup> Advanced, APC<sup>plus</sup> Advanced Sub23, APC<sup>plus</sup> Certification **OR** APC xApp series.

Target Group

Operation (Test Operator), Maintenance & Service (Calibration / Maintenance / Service personnel)

Target

The participants are able to operate the Particle Counter, to perform measurements and carry out simple maintenance work.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Basic knowledge of emissions measurement & legislation
- Overview of system set-up (mechanical, pneumatical and electrical installation) and installation
- Operation (measurement principle and different measurement procedures, operating states and functions and operation via PUMA system or PC, important parameters, options)

## Session 2:

- Maintenance
  - Automatic checks and function checks (leak check internal and external, response check and flow check)
  - Basic maintenance (cleaning Venturi pump, changing the filter element and replacing filter mats, refilling Butanol, drain procedure of the CPC and changing wicks)

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT PARTICLE COUNTER DUAL MEASUREMENTS**

Training for AVL Particle Counter APC xApp series dual measurements of 10 nm & 23 nm.

Target Group

Operation (Test Operator), Maintenance & Service (Calibration / Maintenance / Service personnel)

Target

The participants are able to operate the Particle Counter to perform dual measurements and carry out simple maintenance work.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Basic knowledge of emissions measurement & legislation
- Overview of system set-up (mechanical, pneumatical and electrical installation) and installation for dual measurements
- Operation (measurement principle and different measurement procedures, operating states and functions and operation via PUMA system or PC, important parameters, options)

## Session 2:

- Maintenance
  - Automatic checks and function checks (leak check internal and external, response check and flow check)
  - Basic maintenance (cleaning Venturi pump, changing the filter element and replacing filter mats, refilling Butanol, drain procedure of the CPC and changing wicks)

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT OPACIMETER (AVL 439)**Target Group

Operation (Test Operator), Maintenance & Service (Calibration / Maintenance / Service personnel)

Target

The participants are able to operate the Opacimeter, to perform measurements and to carry out simple maintenance.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Basic knowledge of emissions measurement
- Differences of previous generations to G004 (G005)
- Overview of system set-up (mechanical, pneumatical and electrical installation), installation and options
- Operating, measurement principle and procedures, operating states and functions, controlling the Opacimeter

## Session 2:

- Maintenance
  - Cleaning window modules, measuring chamber and sampling lines, changing the filter element
  - Leak check, calibration and linearity check
  - Temperature reference measurement at measuring tube

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – OPERATION & BASIC MAINTENANCE AT SMOKE METER 415SE (AVL 415)**Target Group

Operation (Test Operator), Maintenance & Service (Calibration / Maintenance / Service personnel)

Target

The participants are able to operate the AVL Smoke Meter, to perform measurements and to carry out simple maintenance.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1:

- Basic knowledge of particulate measurement
- Differences 415S to 415SE with an overview of system set-up and installation
- Operation
  - Measurement principle and different measurement procedures, parameters, operating states and functions, controlling the AVL Smoke Meter, options

## Session 2:

- Maintenance
  - Cleaning reflectometer head, light gates, camshaft, sampling probe, sampling lines, white value plate, changing the filter element
  - Leak check, sampled volume check (using volume tester) and reflectometer head check (using reflectance standards)

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6. persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

**REMOTE TRAINING – OPERATION AT AMA i60**

This training refers to AMA i60 generation series.

Target Group

Operation (Test Operator), Maintenance & Service (Calibration / Maintenance / Service personnel)

Target

The participants understand the principles of analyzers and the layout of AMA i60. They are able to operate the main functions. The participants obtain a basic understanding of the foundations of emissions measurement.

The training includes:

- 6 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Basics of emissions measurement and legislation
- Overview of the customer specific system configuration
- HSS-prefilter
- Measurement principles of the analyzers
- Pneumatic layout of the customer specific analyzers
- Physical and pneumatic layout of AMA i60
- Electric components and control layout
- iGEM AMA software operation
- Operation of AMA i60
- Parameterization on operator level

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- The training covers approximately 80% of the TTAMAI60OP.01 training

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

## REMOTE TRAINING – OPERATION AT AMA SL

This training refers to the AMA SL generation.

### Target Group

Operation (Test Operator), Maintenance & Service (Calibration / Maintenance / Service personnel)

### Target

The participants obtain an understanding of the fundamentals of emission measurement. They understand the measuring principles of analyzers and the setup of the AMA SL and its components. The participants are able to operate the main functions.

### The training includes:

- 6 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Basic knowledge about combustion process and the application
- General technical information and technical details about the AVL AMA SL
- Hardware structure
  - Pre-Filter
  - Chiller module
  - Power distribution unit (PDU), Analyzer valve unit (AVU) & Span gas unit (SGU)
  - Condensate removal & toxic waste
- Overall flow diagram of the system and Pre-Filter
- Gas paths for measure, zero & span gas adjustment and linearity check
- iGEM AMA bench control software
  - General information, iGEM AMA software structure and operation
  - Customer specific configuration of user interface (favorites, layout manager)
  - Checks, scheduling and diagnostics

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- The training covers approximately 80% of the TTAMASLOP.02 training

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2<sup>nd</sup> monitor recommended

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee



## 7. TRAINING FOR IN VEHICLE MEASUREMENT

### 7.1. REM.TRAIN. M.O.V.E DATA TOOLBOX

TTRMOVEDTB.01

#### REMOTE TRAINING – AVL CONCERTO 5 M.O.V.E DATA TOOLBOX

A training to help you evaluate your PEMS measurement data for your certification or R&D needs.

##### Target Group

Testing and Data Evaluation Engineers

##### Target

The participants are able to evaluate measurement data recorded with AVL M.O.V.E systems with AVL CONCERTO utilizing M.O.V.E Data Toolbox Work Environment. They also receive an overview of legislation requirements (prior communication necessary) and a general update to CONCERTO's functionalities to display data.

##### The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

##### Content

- Legislation Update (depending on customer needs)
- CONCERTO 5 MDT (last release or customer version), overview on functionalities
- Post processing and discussion of demo data (ideally provided by the customer)
- Independent repetition of post processing supported by the trainer
- Additional functionalities of CONCERTO 5 MDT
- Q&A-Session

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of RDE measurements is recommended

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – M.O.V.E System Control Software Functionalities and Workflow**

A guidance to getting the most out of your AVL M.O.V.E System Control and how to operate it most efficiently.

Target Group

Operation (Test Operator), Parameterization (Test Engineer), Data Evaluation (Post Processing personnel), Maintenance & Service (Calibration / Maintenance / Service personnel)

Target

The participants are able to operate an AVL M.O.V.E System via the AVL M.O.V.E System Control Software. They can set up tests with the appropriate hardware configuration and execute measurements for their application.

They are familiar with the theoretical background and parametrization of tests, with a focus on pre- and post-tests for PEMS testing.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- AVL M.O.V.E System Control architecture (Hardware, Software)
- Interfaces (GPS, ambient conditions, CAN, OBD adapter)
- Integration of AVL devices (e.g. GAS PEMS, PM PEMS, PN PEMS, M.O.V.E EFM, FID iS Module and PLUTron)
- AVL M.O.V.E System Control operation
- Test configuration for Pre-, Main- and Post test
- Visualization of data (creation and customization of layout pages and display objects)

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of RDE measurements is recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – APPLICATION MSS 2 (AVL 497) INTEGRATION INTO M.O.V.E ENVIRONMENT**Target Group

Operation (Test Operator), Maintenance (Calibration / Maintenance / Service / Commissioning personnel)

Target

The participants are able to operate the AVL Micro Soot Sensor 2 as a stand-alone device, to perform measurements, to carry out basic service and maintenance and are able to perform an integration into the RDE (M.O.V.E) environment with operation.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

## Session 1: MSS 2 day

- Components and options, range of applications, options (RDE)
- Differences MSS Plus to the MSS 2
- Operating the MSS 2 as stand-alone device
  - Controlling, operating states and functions, important parameters and pneumatical features
- Basic maintenance and service tasks

## Session 2: M.O.V.E day

- Connections, compatibility, integration
- Use cases and boundary conditions (EFM, System Control, INCA, CAN, CM, E-Box, PEMS, AVL CONCERTO et al.), building up and conversion - M.O.V.E set-up, AVL M.O.V.E System Control, AVL CONCERTO 5 - M.O.V.E Data Toolbox

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge
- Basis knowledge of Micro Soot Sensor Plus preferable

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Training – ONE SEAT**

## 8. TRAINING FOR BATTERY TEST SYSTEMS

### 8.1. REM.TRAIN. BATTERY TESTING OPERATION

TTRLYNXOPE.01

#### REMOTE TRAINING – OPERATION OF LYNX FOR BATTERY TESTING

This training refers to the product E-STORAGE BT (Tester) and LYNX version 2.0 or above.

##### Target Group

Operation (Test Operator), Parameterization (Test Engineer)

##### Target

The participants are able to operate the LYNX automation system. They are able to define and execute manual measurements and run pre-defined test runs.

##### The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

##### Content

- Starting the system
- Manual and automatic operation
- Limit monitoring and operating states
- Definition and execution of manual measurements
- Operation of a pre-defined recorder
- Values and results display
- Overview of LYNX parameter sets (test cell-, stand-, battery- and test parameters)
- Selection of parameter sets
- Reviewing data with the Data Browser
- Using the message window
- Using the help functions

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – SET-UP OF LYNX FOR BATTERY TESTING**

This training refers to LYNX version 2.0 and above in combination with E-STORAGE BT (Tester)

Target Group

Parameterization (Test Engineer)

Target

The participants are able to configure the LYNX automation system. They are able to set up channels, connect input/output devices, and parameterize automatic test runs.

The training includes:

- 6 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Overview of hardware architecture
- Content of testcell-, stand-, battery- and test parameter sets
- Setting up input / output channels
- CAN channel configuration
- Writing automatic test runs, startup and shutdown routines
- Sequence library and subroutines
- Creating and use datasheets
- Setup of exception routine
- Creating and editing formulas
- Setting up of testcell limits and engine limit groups
- Data post processing with data browser (check of results)
- Importing and exporting of test run parameters

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons
- "TRAINING LYNX BATTERY TESTING OPERATION" (TT03EA020A.02) or equivalent knowledge about automation technics

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE TRAINING – OPERATION & PARAMETERIZATION OF PUMA 2 AS BATTERY EMULATOR**

This training refers to PUMA 2 and E-STORAGE Hardware.

Operation and parameterization of the Battery Emulator and AVL battery models MoBat on PUMA 2 as used for controlling the E-STORAGE.

Target Group

Operation (Test Operator), Parameterization (Test Engineer)

Target

The participants are able to operate the E-STORAGE system by starting and stopping. They are able to select an existing battery model and edit its parameters. They are also able to parameterize values of the system. In addition, they know the function of the complete system.

The training includes:

- 4 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Introduction to general safety instructions
- Description of the different system components
- Operation of the systems via web interface
- PUMA 2 (TAS)
- Battery model
  - Basic knowledge of battery behavior
  - Activation of the standard battery models delivered by AVL
  - Adaptation of initial values
  - Adaptation of basic parameters

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 6 persons

Prerequisites

- PUMA 2 basic knowledge
- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

## 9. SEMINARS

### 9.1. REM.SEM. DEVICE.CONNECT

TTRDEVCONN.01

#### REMOTE SEMINAR – DEVICE.CONNECT

##### Target Group

Project Management, Testbed Engineers / Leaders, Technicians in Sales, Service, Commissioning, Engineering and Development

##### Target

The participants know the functions of Device.CONNECT, the working concept and the range of applications as part of the AVL Digital Services portfolio.

##### The training includes:

- 1 Session (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

##### Content

- Features of Device.CONNECT when interlinking devices globally
- Platform as a part of the AVL Digital services Portfolio for relevant business cases (AVL Maintenance Manager, AVL Smart Reports)
- Explanation of the working concept, advantages, environment & situation analysis, integration possibilities & concepts
- Fields of application (testbeds, RDE data management and much more)
- Connectivity with maximum security (protection and communication settings) meeting ISO 270xx / IEC62443 safety and security standards
  - Best practice and experiences
- Smart Hub installation & device connection, channels and data logging examples

##### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons
- Depending on availability as additional support an invitation to Product Management / AVL DiTest / Customer Services, et al.

##### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

##### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**REMOTE SEMINAR – MICRO SOOT SENSOR 2 (MSS 2 – AVL 497)**Target Group

Testbed Engineers / Leaders, Technicians in Sales, Service, Commissioning, Engineering and Development

Target

The participants know the new features of the MSS 2 (AVL 497) related to the Micro Soot Sensor Plus (AVL 483) including operation, checks and regular maintenance work.

The training includes:

- 1 Session (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Theoretical part – introduction
- Differences of the MSS 2 (AVL 497) related to the Micro Soot Sensor Plus (AVL 483)
  - What's new? Hardware and software features
  - Advantages in the testbed and for RDE applications
- Checks and calibration tasks
- Operating the MSS 2
- MSS 2 integration into M.O.V.E environment

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Basic knowledge of mechanics, measurement techniques
- General testbed knowledge
- Basis knowledge of the AVL Micro Soot Sensor Plus (AVL 483) preferable

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**



**REMOTE SEMINAR – OPACIMETER G005 (AVL 439)**Target Group

Testbed Engineers / Leaders, Technicians in Sales, Service, Commissioning, Engineering and Development

Target

The participants know the new features of the Opacimeter G005 including operation, checks and regular maintenance work.

The training includes:

- 1 Session (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Theoretical part – Introduction
- Differences of G005 to former generations
  - What's new? Hardware and software features
  - Advantages in the testbed and for operating
- Possibilities of converting the AVL Opacimeter G004 to G005
- Checks and calibration tasks
- Operating the G005

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- General testbed knowledge
- Basis knowledge of the AVL Opacimeter preferable

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**

**REMOTE SEMINAR – OVERVIEW OF THE PUMA IO-INTERFACES AND THEIR POSSIBILITIES**Target Group

Operator, Parameterization & Test Engineer

Target

The participants know which Bus-systems can be used under PUMA and are informed about their limitations, advantages and disadvantages.

The training includes:

- 1 Session (3-hour block), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- OSI Model
- Overview of the various PUMA IO-Interfaces
  - CAN-Bus
  - Profibus
  - Profinet
  - IEEE1394
  - EtherCAT
- Purpose of the various Bus-systems
- Parametrization examples

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons
- Training Materials available just in English

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**

**REMOTE SEMINAR – ELECTRIC VEHICLE BASICS - SYSTEM SETUP, DEVELOPMENT AND TEST**

Introduction to drivers of vehicle electrification, basics of electrified vehicle setup and components and their test.

Target Group

Participants with technical background, decision makers interested in the topic

Target

The participants have an overview of the background of the current electrification development. They know the basic components of an electric vehicle and their working principle. They know the applications to test these and have an overview over electrification testbeds in general and the devices they contain.

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Background and drivers of current electrification development, xEV definitions
- Components of an electrical drivetrain
  - Battery technology/fuel cell technology
  - E-Motor technology
  - Inverter technology
- Electrification tests, applications
- Electrification testbeds and devices

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**

## REMOTE SEMINAR - BATTERY TECHNOLOGY BASICS

Introduction to battery technology, nomenclature, battery components and implications of battery testing.

### Target Group

Participants with general knowledge of electrification components and battery building blocks who want to get more in-depth knowledge of e-vehicle battery technology and testing.

### Target

The participants have an overview of the components of a vehicle battery, its common metrics and comparative numbers for the different technologies. They get an idea what considerations to take into account when developing vehicle batteries and have an overview of common battery test scenarios.

### The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Background and overview of electric storage systems for vehicles
- Common units and measures in batteries
- Battery electrochemistry, cell mechanical structures and vehicle battery components
- Current challenges and development targets
- SOx functions and their estimation
- Role of the Battery Management System
- Thermal management considerations
- Common battery test scenarios
- Common battery test devices

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Successful participation in "SEMINAR ELECTRIC VEHICLE BASICS" (TT08EVB01O.01) or similar knowledge required

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**

**REMOTE SEMINAR - E-MOTOR AND INVERTER TECHNOLOGY**

Introduction to e-motors, types of e-motors and their components, e-motor development and test. Introduction to the inverter, its components, development and test.

Target Group

Participants with general knowledge of electrification components of an electric or hybrid vehicle that want to get more in-depth knowledge of e-vehicle, e-motor and inverter technology and testing.

Target

The participants have an overview of the anatomy and functionality of a vehicle e-motor and the corresponding inverter. They get an idea what considerations to take into account when developing e-motors and inverters for vehicles and an overview of common e-motor and inverter test scenarios

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Vehicle traction motor (e-Motor)
  - Functional principle of the dominating vehicle e-motors
  - Review of Traction Motor candidates: Induction, Synchronous
  - Measures of traction motors: Torque/speed curve, field weakening, constant power/speed
  - Torque production: Magnet vs. reluctance
  - Production processes
  - Thermal considerations
  - Current challenges and development targets
- Power electronics for xEV (Inverter)
  - Traction drives
  - Schematics principle
  - Current challenges and development targets
- e-motor and inverter test scenarios
- e-motor and inverter testbed structures and devices

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Successful participation at the "SEMINAR ELECTRIC VEHICLE BASICS" (TT08EVB01O.01) or comparable knowledge level

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**

**REMOTE SEMINAR – FUEL CELL TECHNOLOGY BASICS**

Introduction to Fuel Cells, components and technology of the Fuel Cell and Fuel Cell System, their test and Fuel Cell applications.

Target Group

Participants with technical background, decision makers interested in the topic.

Target

The participants are able to understand the functionality of fuel cells, identify all components, have an insight into materials and production methodologies, understand the integration to a complete fuel cell system and the integration of the system into different vehicles. They have an overview over test methodologies and testbeds and knowledge about most of the fuel cell applications

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Fuel Cell Chemistry and Physics (PEMFC, SOFC)
- Fuel Cell System Setup
- Fuel Cell Vehicle Integration
- Fuel Cell Design Challenges and H2 Infrastructure
- Fuel Cell Testing and Validation
- AVL Fuel Cell Testbeds and Devices
- Fuel Cell Applications

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended
- Successful participation in the “SEMINAR ELECTRIC VEHICLE BASICS” is advantageous

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**

## REMOTE SEMINAR – EMISSIONS TECHNOLOGY BASICS

This seminar offers a short overview on the basics of exhaust gas emissions and exhaust gas aftertreatment in modern vehicles with internal combustion engines, the requirements of legislation and the resulting requirements for automotive development.

### Target Group

Specialists, technicians, engineers in the automotive industry mainly active in the development of products for the mobility of the future.

### Target

The participants get an overview on transport emissions and emission legislation as well as emission reduction technologies.

### The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

### Content

- Overview and principles of emissions legislation
- Exhaust of combustion engines
- Emissions reduction in combustion engines
- Catalysts
- Particle filter
- NOx Reduction
- Exhaust aftertreatment  $\Lambda = 1$
- Exhaust aftertreatment  $\Lambda > 1$

### Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

### Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

### Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**

**REMOTE SEMINAR – REAL DRIVING EMISSIONS (RDE)**

This seminar provides a compact overview on the topic of "Real Driving Emissions", its current state of legislation, instrumentation and implications for automotive development.

Target Group

Participants with general knowledge and interest in emissions and emission testing. Specialists and generalists from the automotive industry involved in any aspect of vehicle emissions, its impacts and requirements for meeting future targets for clean mobility.

Target

The participants have an overview on the complex topic of real driving emissions and its drivers for legislative implementation into EURO 6 vehicle tailpipe emissions legislation. Participants will also get an impression on the complexity of the RDE implementation at present and possible scenarios for its evolution in future. Finally participants should know the impacts on the different stakeholders to this wide topic (Policymakers, EU Member States, Automotive Industry, Customers, NGOs).

The training includes:

- 2 Sessions (3-hour block each), date and time schedule to be agreed
- Training Material
- AVL Certificate for participants

Content

- Drivers for implementation of RDE (Health, Air Quality)
- RDE policy and implementation within EU certification framework
- Some background – Emissions from Diesel and Gasoline engines – hotspots to be tackled by RDE
- Overview on real driving emission measurement (RDE) & technology
- Equipment and other infrastructure and operational requirements for RDE testing
- Some theory on RDE testing boundary conditions, obstacles and validity criteria
- Considering RDE during the automotive product engineering process
- Current strengths and weaknesses of RDE legislation
- Future roadmap on RDE

Notes

- Training class is conducted either in German or English (based upon customer request)
- Max. participants: 20 persons

Prerequisites

- Remote training via Internet-Services: Stable internet connection required
- Headset, Webcam and 2nd monitor recommended

Cancellation and Rescheduling

Cancellation or rescheduling of confirmed training dates are subject to the following cancellation policy and fees:

- >14 calendar days prior to training start: 50% of the training fee
- 14 calendar days or less prior to training start: 100% of the training fee

**Also available as Open Seminar – ONE SEAT**



# Overview Remote Open Trainings and Seminars 2021

Training Title	Training dates
<b>Training for Testbed Systems</b>	
Remote Training PUMA 2 Fuel Cell	June 28 – July 1, 2021
Remote Training PUMA Hybrid Engine Testbed	July 19-22, 2021
Remote Training PUMA E-Motor Testbed	November 08-11, 2021
Remote Training PUMA Engine Testbed	November 22-25, 2021
<b>Training for Monitoring, Control &amp; Simulation</b>	
Remote Training Testbed Controller	June 14-16, 2021
<b>Training for Testbed Automation</b>	
Remote Training PUMA Testrun Preparation	March 1-3, 2021
Remote Training Test Cell Control (TCC)	March 29-30, 2021
Remote Training CONCERTO Evaluation	April 12-13,2021
Remote Training CONCERTO Advanced	April 14-15,2021
Remote Training Scripting in PUMA	May 17-20, 2021
Remote Training ISAC 400	June 7-10,2021
Remote WS CONCERTO Python	July 12-13,2021
Remote Training PUMA Testrun Preparation	September 6-8, 2021
Remote Training CONCERTO Evaluation	October 4-5, 2021
Remote Training CONCERTO Advanced	October 6-7,2021
Remote Training ISAC 400	October 11-14,2021
Remote Training iGEM 2 Basics	November 10-12, 2021
<b>Training for Consumption Measurement</b>	
Remote Training Fuel Exact MF PLU	April 2, 2021
Remote Training Fuel MF Temp Control	August 6, 2021
<b>Training for Emission Analysis &amp; Measurement</b>	
Remote Training Upgrade to MSS 2	April 22, 2021

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<b>Training Title</b>	<b>Training dates</b>
Remote Training Particle Counter	June 11, 2021
Remote Training Upgrade to MSS 2	October 7, 2021
Remote Training Smoke Meter	November 8, 2021
<b>Training for In Vehicle Measurement</b>	
Remote Training MSS 2 Integ. M.O.V.E	June 21, 2021
<b>Seminars</b>	
Remote Seminar PUMA IO-Interfaces	March 29, 2021
Remote Seminar Electric Vehicle Basics	April 7, 2021
Remote Seminar Emissions Technology Basics	April 7, 2021
Remote Seminar E-Motor and Inverter Technology	April 8, 2021
Remote Seminar Real Driving Emissions (RDE)	April 8, 2021
Remote Seminar Battery Technology	April 13, 2021
Remote Seminar Fuel Cell Technology	April 14, 2021
Remote Seminar Micro Soot Sensor 2	April 23, 2021
Remote Seminar Opacimeter G005	April 30, 2021
Remote Seminar Emissions Technology Basics	June 8, 2021
Remote Seminar Electric Vehicle Basics	June 9, 2021
Remote Seminar Real Driving Emissions (RDE)	June 9, 2021
Remote Seminar Fuel Cell Technology	June 10, 2021
Remote Seminar Battery Technology	June 22, 2021
Remote Seminar E-Motor and Inverter Technology	June 23, 2021
Remote Seminar Emissions Technology Basics	September 28, 2021
Remote Seminar Real Driving Emissions (RDE)	September 29, 2021
Remote Seminar Micro Soot Sensor 2	October 8, 2021
Remote Seminar Electric Vehicle Basics	November 22, 2021
Remote Seminar E-Motor and Inverter Technology	November 23, 2021
Remote Seminar Battery Technology	November 24, 2021
Remote Seminar Fuel Cell Technology	November 25, 2021