



Upgrade von bestehenden Motorprüfständen bis hin zu einer gesamtheitlichen Brake-Wear-Test-System Lösung



Kurzvorstellung



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Zuständigkeitsbereich:

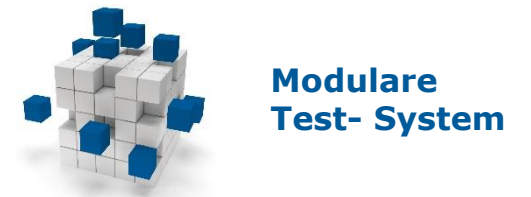
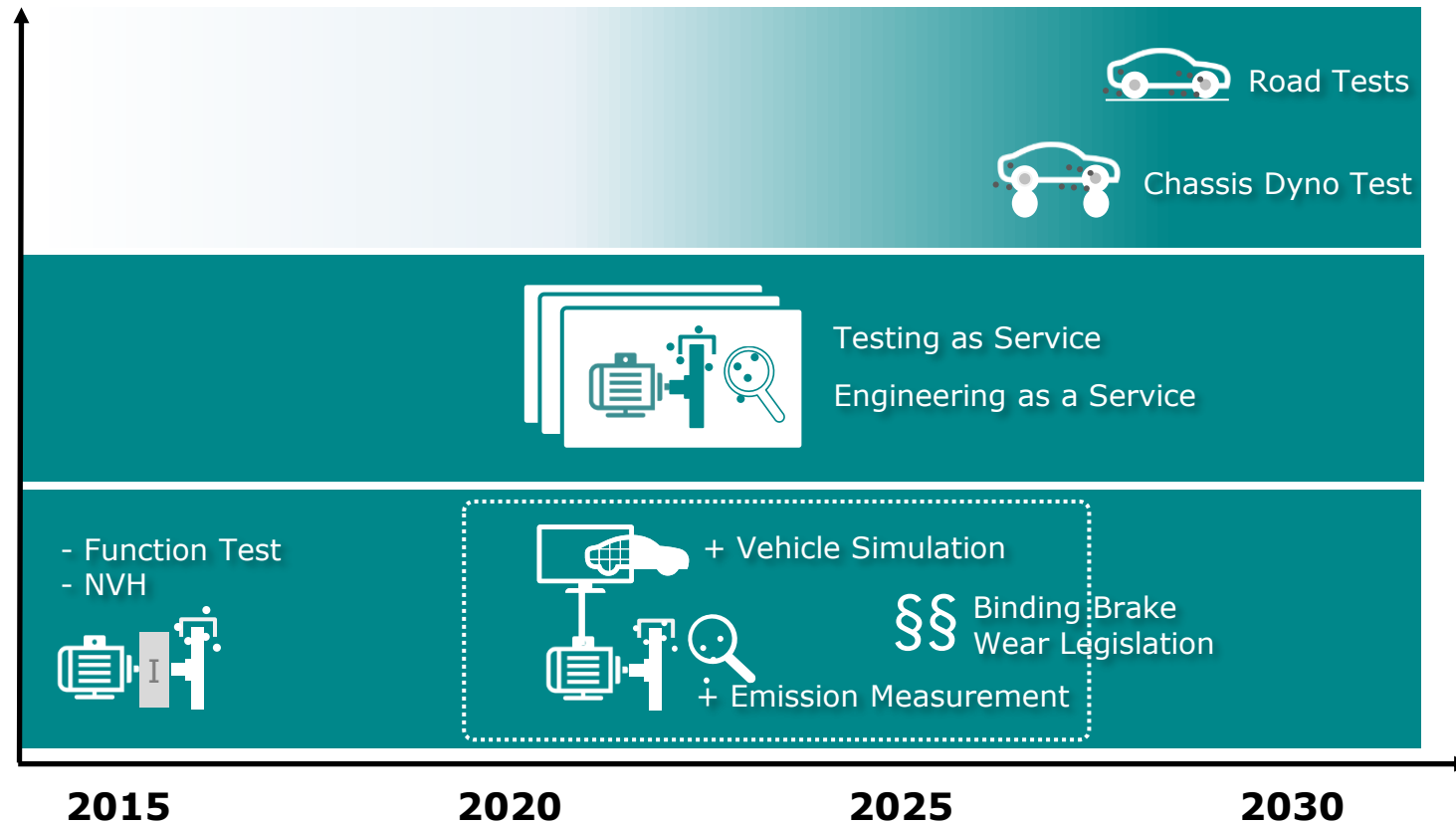
- Prüfstand Konzeptionierungen
- Kalkulationen
- Applikation Management

Co-Autor:

Tobias Zimmermann

Affiliate Application Lead

Übersicht und Einschätzungen



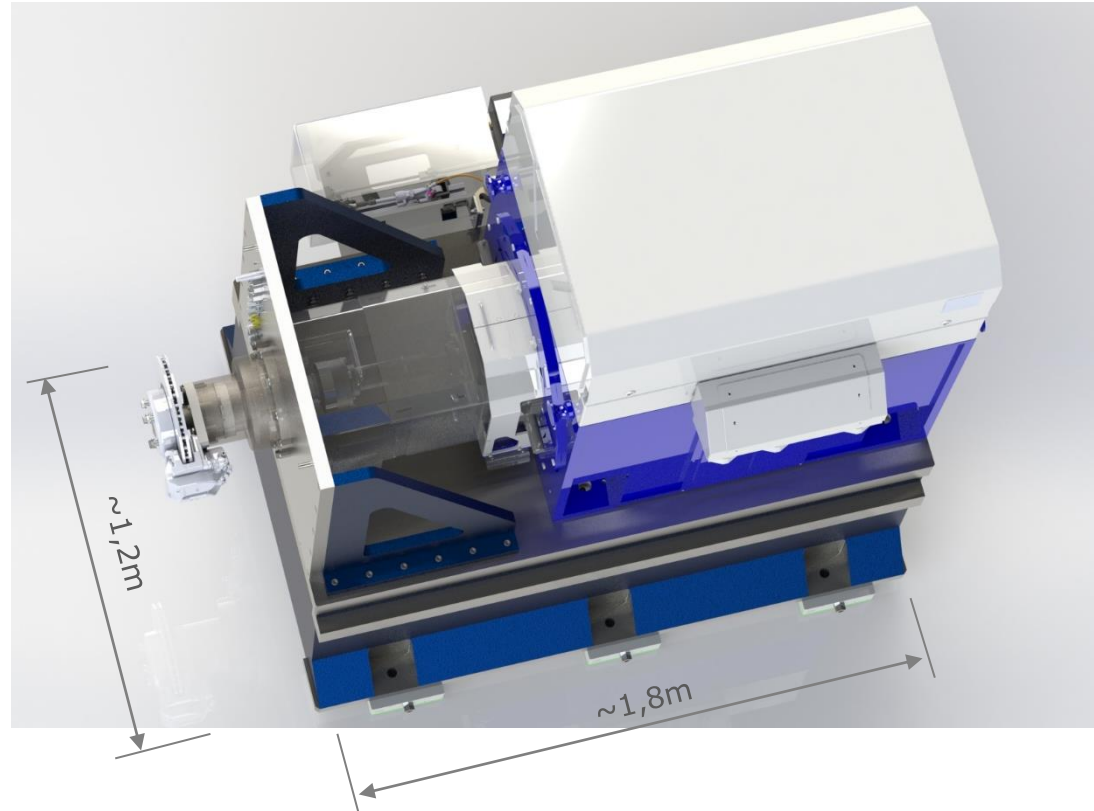
AVL Test System

Active Dyno

Fahrzeug
Trägheitssimulation via
elektr. Moment. Regelung

Kompakter Footprint

Min. Platzbedarf bei
bestehender Infrastruktur
von großer Bedeutung



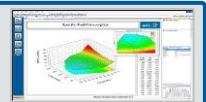
Fzg.
Simulation



Auto. Prüflauf
Steuerung



Ergebnis
Analyse



Software
Toolchain



AVL Test System

Active Dyno

Fahrzeug
Trägheitssimulation via
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von großer Bedeutung

Integrale Lösung

Umfassende Test System
Lösung für Prüf- und
Messtechnik



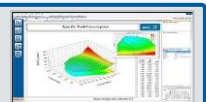
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Simulation



Auto. Prüflauf
Steuerung



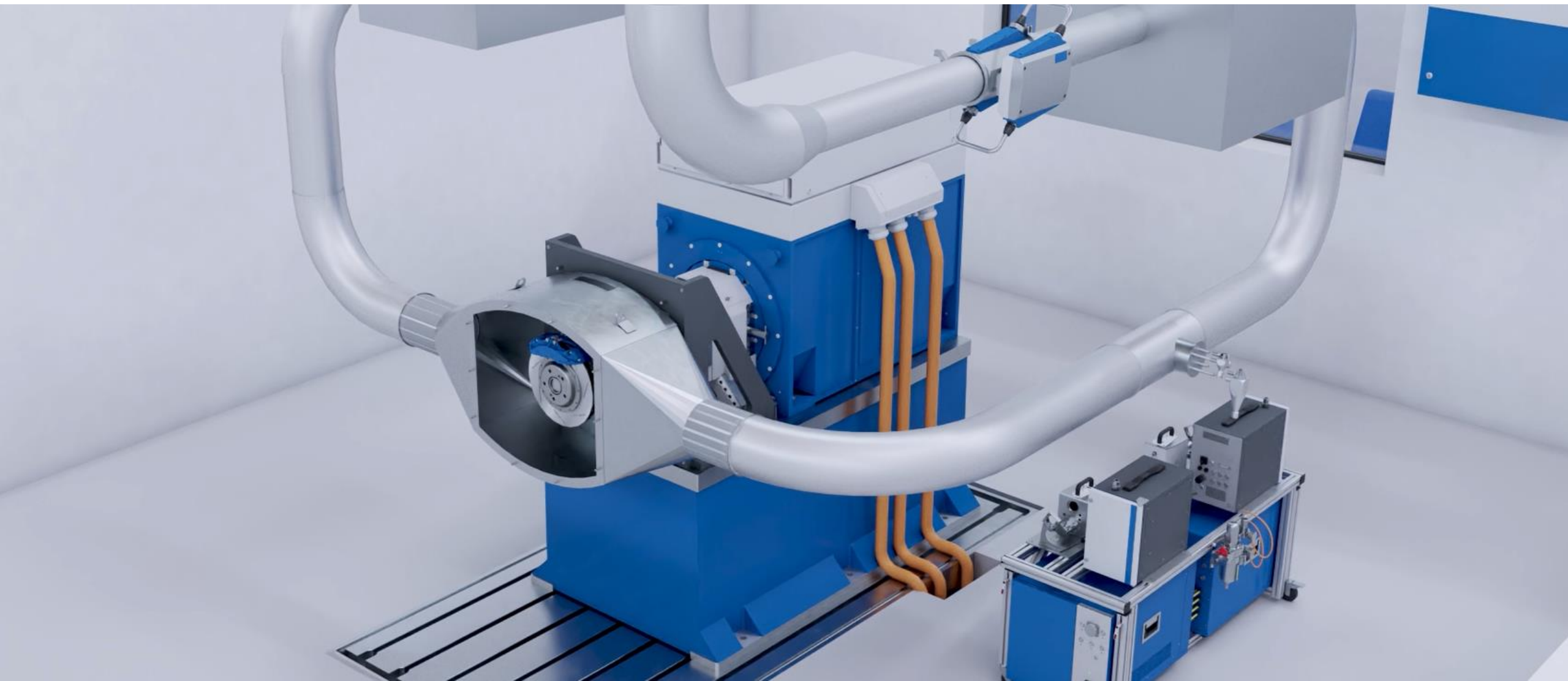
Ergebnis
Analyse



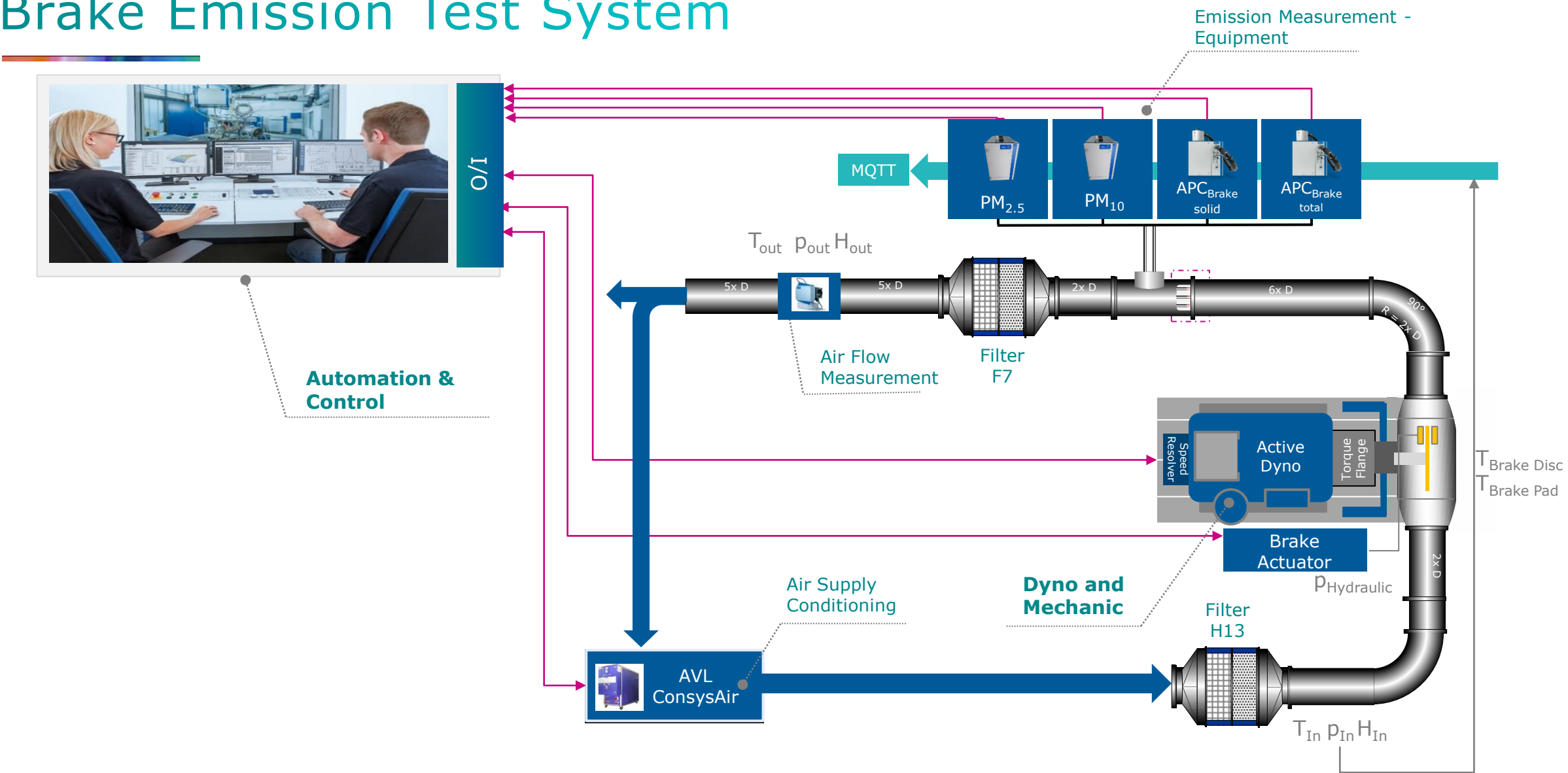
Software
Toolchain



AVL Test System Designlayout



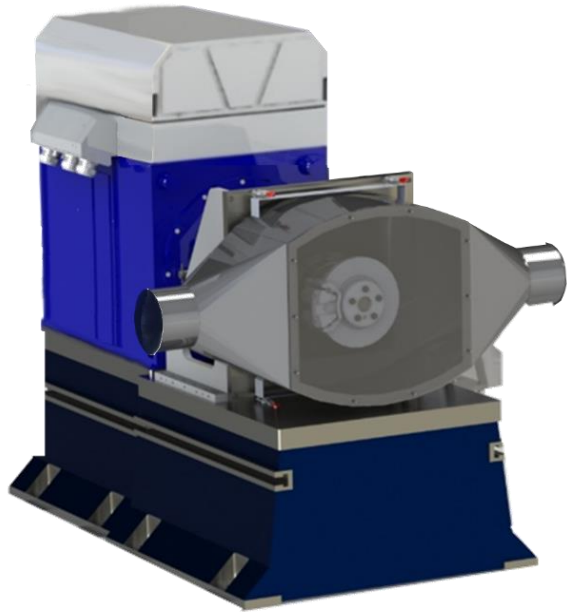
Brake Emission Test System



WLTP Brake Bremsmomentbedarf

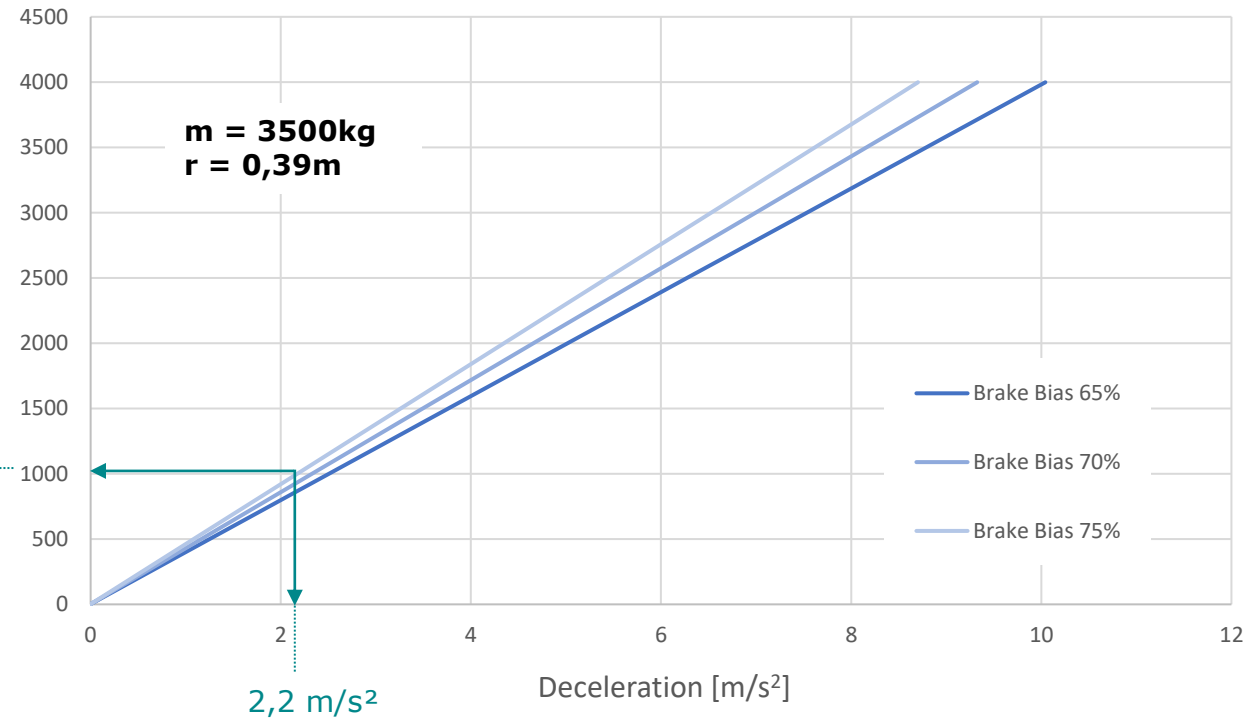
	Cat. 1		Cat. 1-1		Cat. 2	
Masse in fahrbereiten Zustand	VW Golf:	1.584kg	VW T6.1 Bus:	2.311kg	Ford Transit Pritsche:	2.080kg
	BMW X7:	2.490kg	Opel Zafira e-Life:	1.989kg	VW Crafter 35:	2.490kg
Fahrzeug Testmasse	VW Golf:	1.584kg	VW T6.1 Bus:	2.348 kg	Ford Transit Pritsche:	2.515kg
	BMW X7:	2.490kg	Opel Zafira e-Life:	2.026 kg	VW Crafter 35:	2.798kg
Höchstzulässiges Gesamtgewicht	VW Golf:	2.030kg	VW T6.1 Bus:	2.750kg	Ford Transit:	3.500kg
	BMW X7:	3.215kg	Opel Zafira e-Life:	2.965kg	VW Crafter 35:	3.500kg
Reifenradius	BMW X7:	0,39m	Opel Zafira e-Life:	0,34m	VW Crafter 35:	0,355m
Max. Bremsmoment WLTP Brake (Bias 70%, 2,2m/s²)	BMW X7:	748Nm	Opel Zafira e-Life:	556Nm	VW Crafter 35:	764Nm

Bremsmoment – Verzögerung



1003 Nm

Brake Torque [Nm]



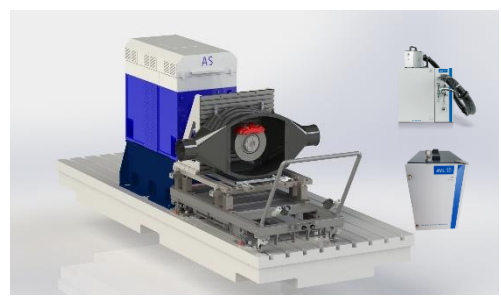
$$T_{\text{Wheel}} = \frac{m_{\text{Test Veh}} \times a_{\text{WLTP}} \times r_{\text{Tire}}}{2_{\text{(Right / Left)}}} \times \frac{b_{\text{Front}}}{100}$$

Zusätzlichen Testbedarf decken

Erweiterung bestehender
Prüfstands Infrastruktur

Neues Brake Emission Test
inkl. Container Facility z.B.

Opt. A



AVL Angebot:
Brake Wear Emission Kit

Bestehend
Motor Pfst. Equipment

Bestehend
Motor Pfst. Infrastruktur

Opt. B



AVL Angebot:
Brake Wear Emission Kit

AVL Angebot:
Pfst. Equipment

Bestehend
Motor Pfst. Infrastruktur

Opt. C

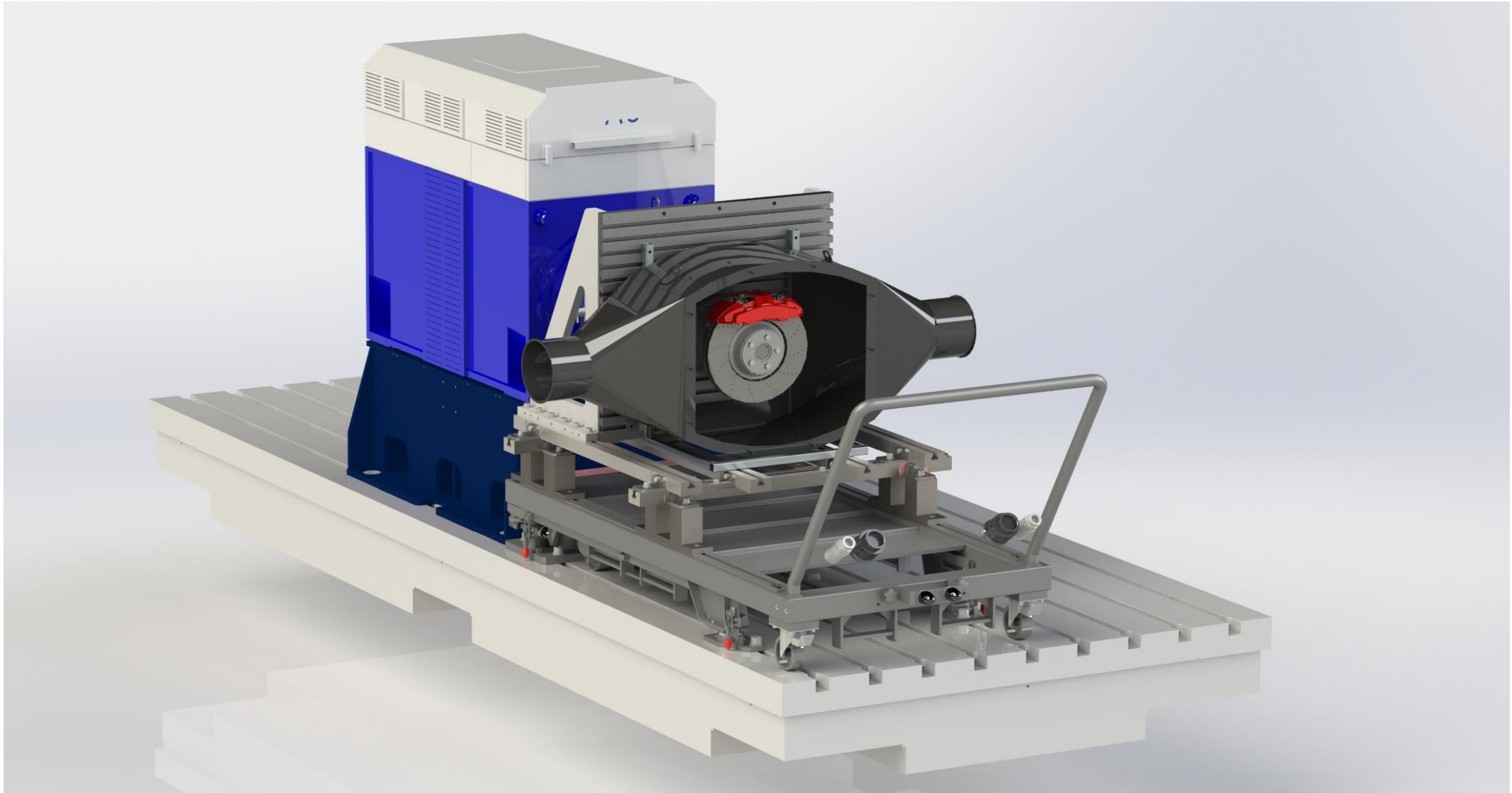


AVL Angebot:
Brake Wear Emission Kit

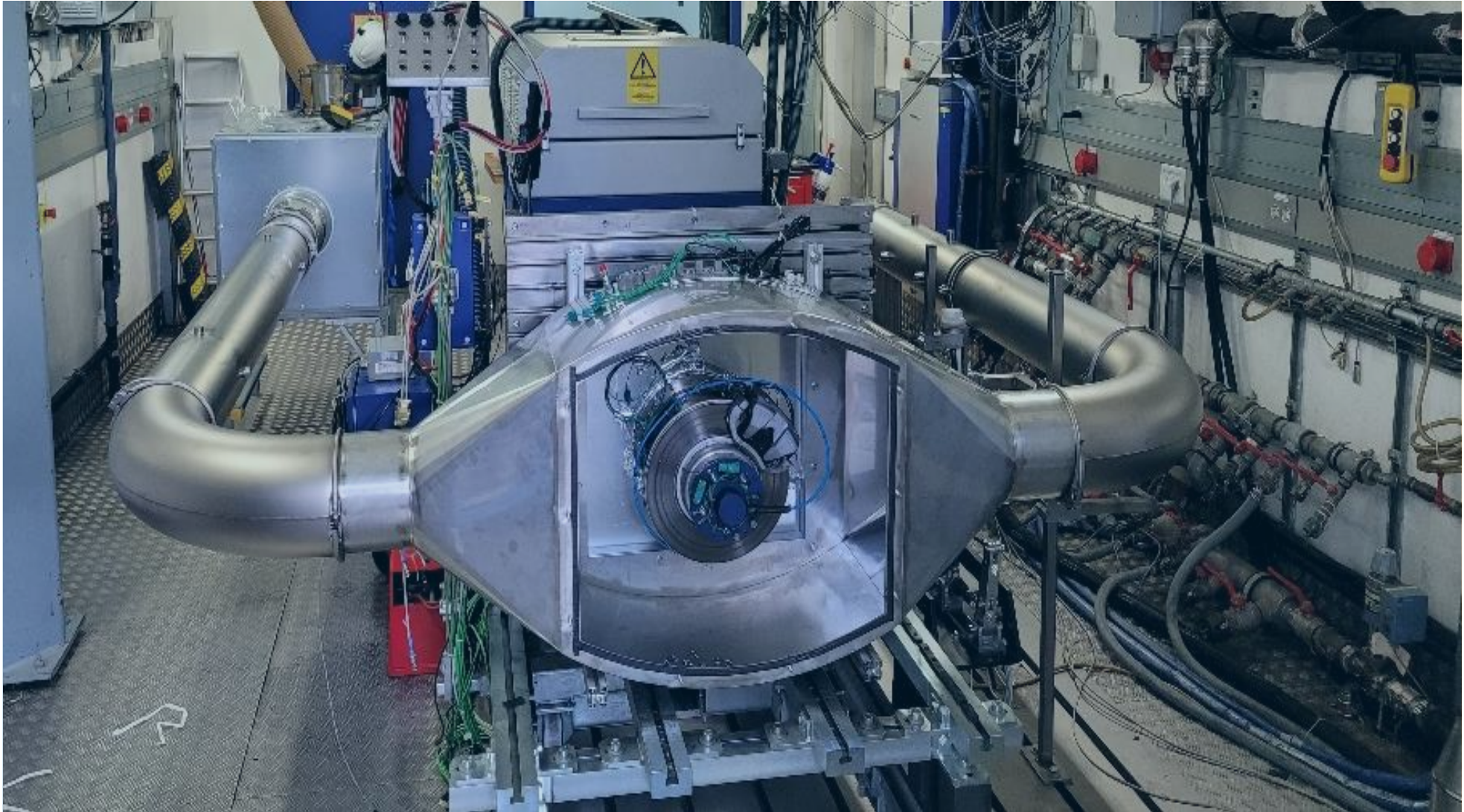
AVL Angebot:
Pfst. Equipment

AVL Angebot:
Pfst. Infrastruktur

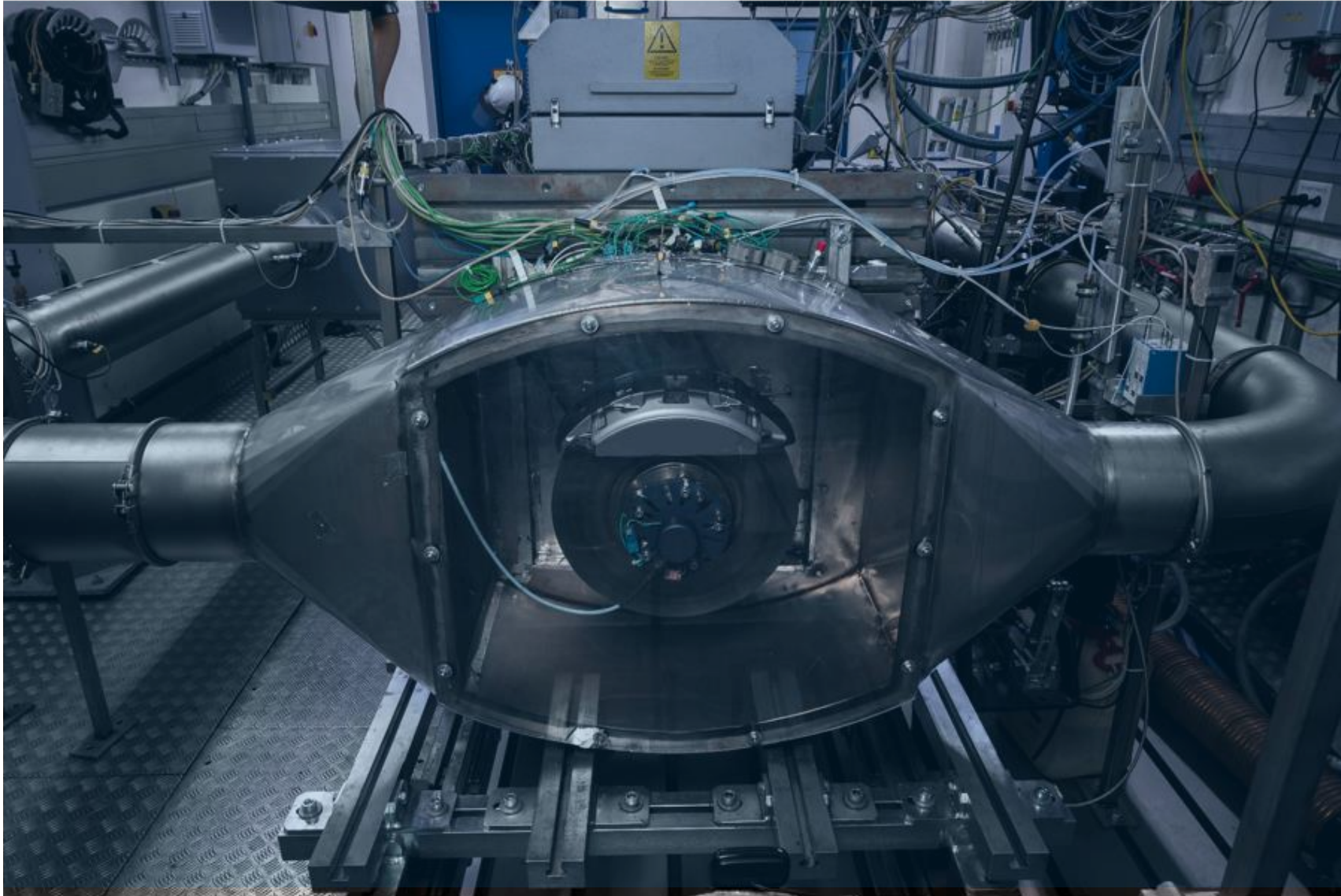
Motor Prüfstands Umbau



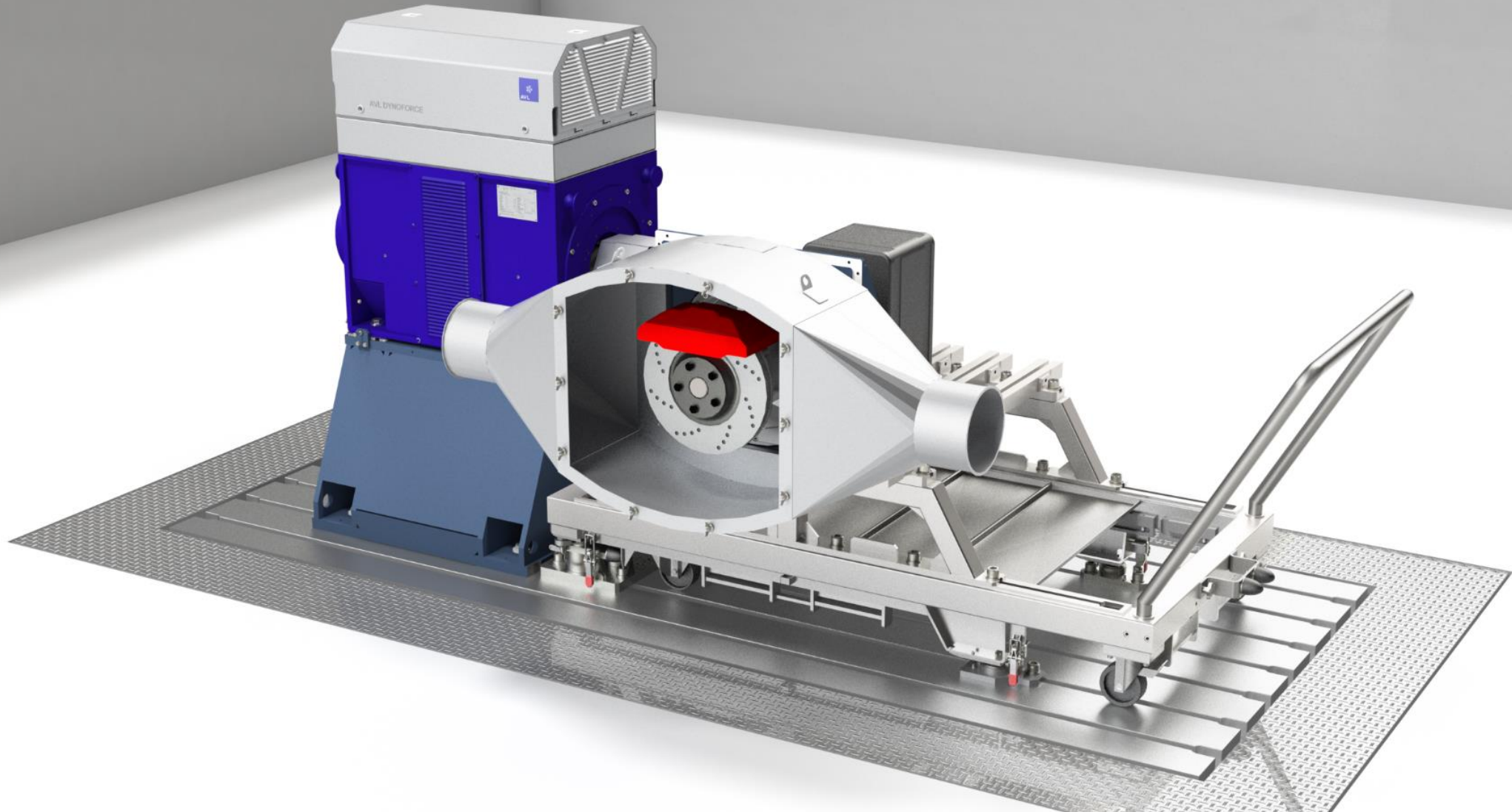
Motor Prüfstands Umbau



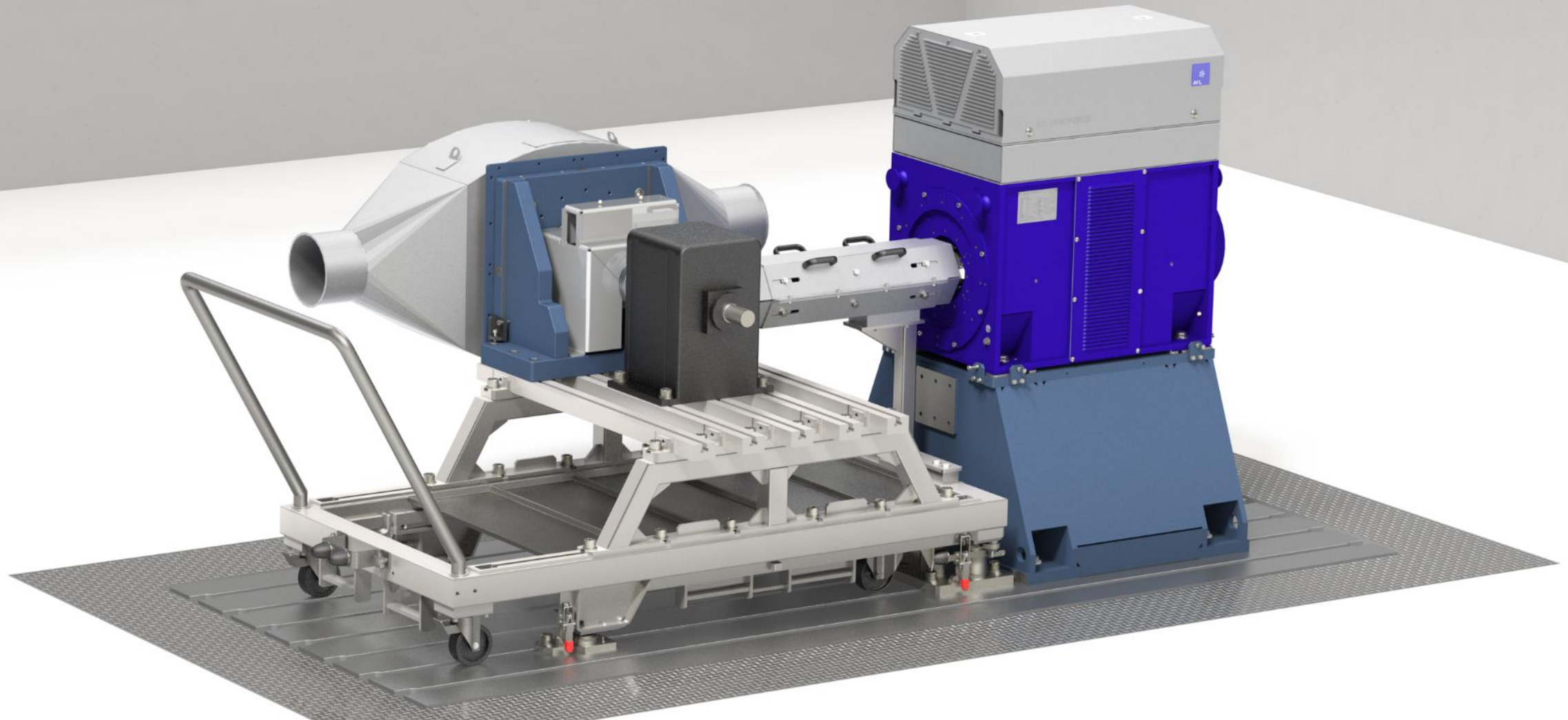
Motor Prüfstands Umbau



Motor Prüfstands Umbau



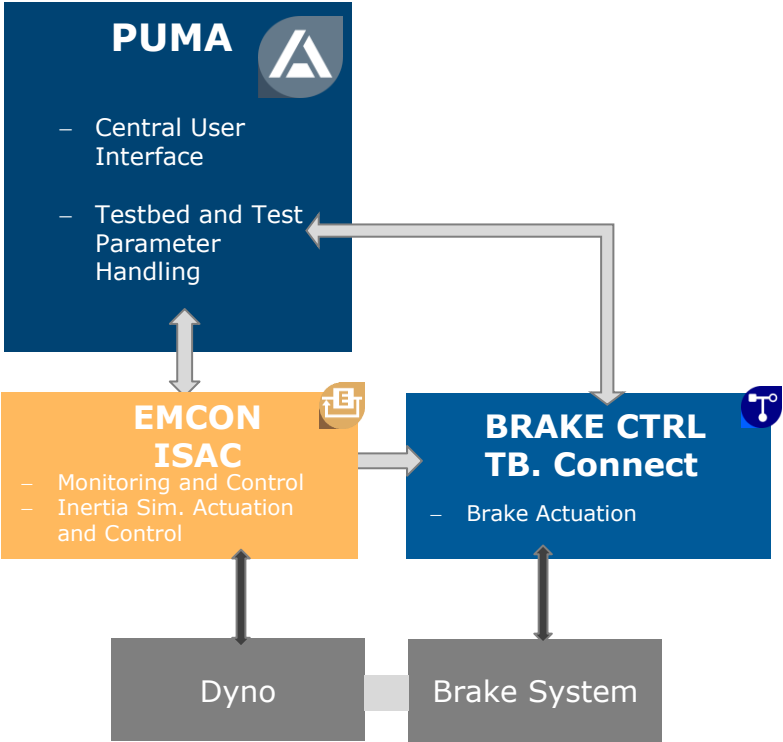
Motor Prüfstands Umbau



Test System Varianten

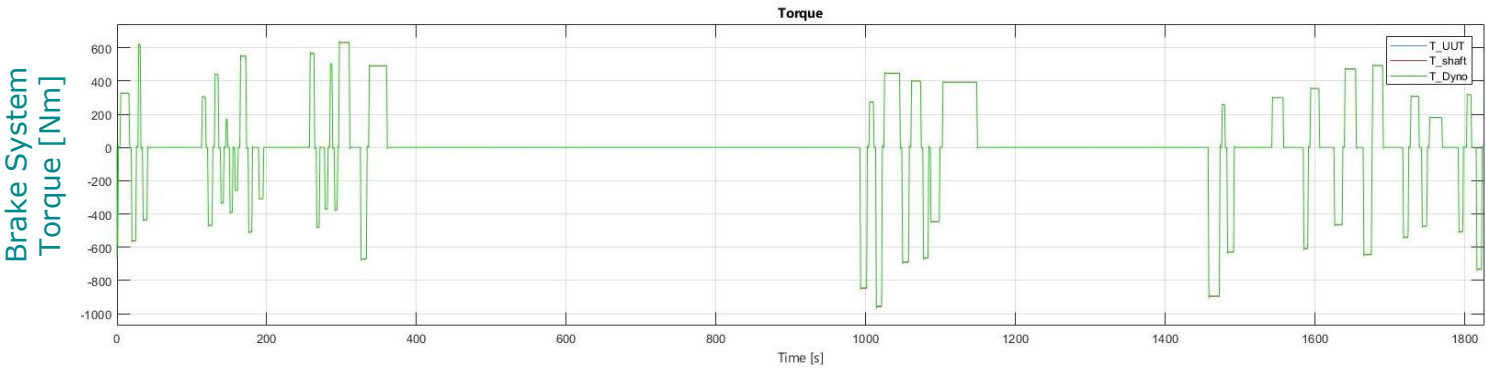
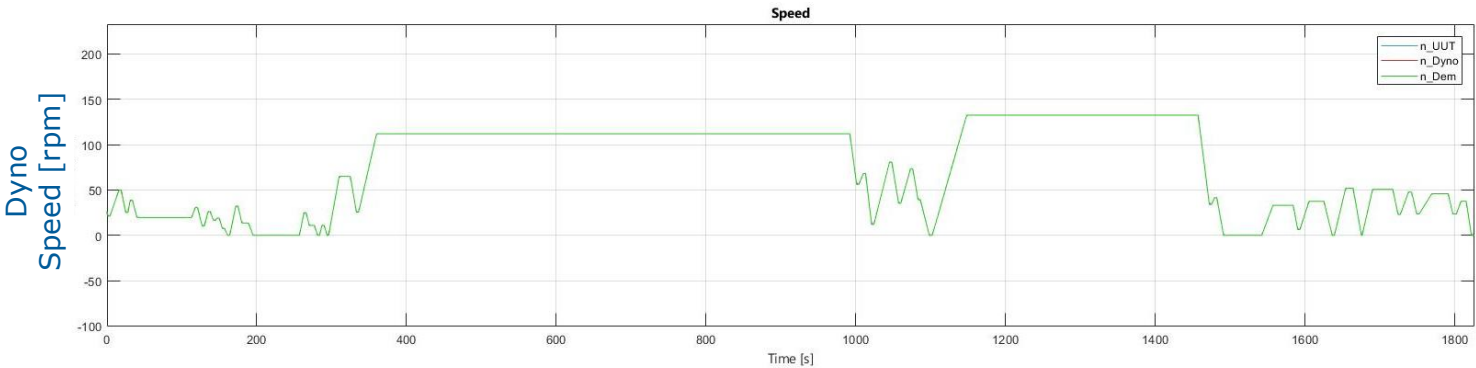
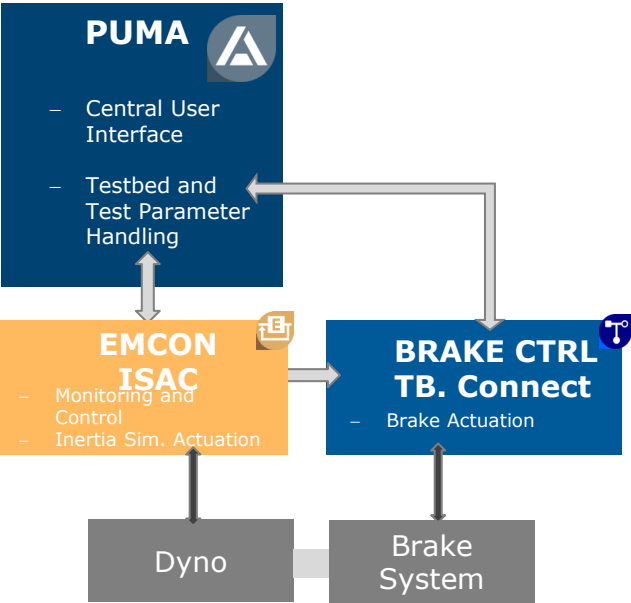


Automation & Control Software

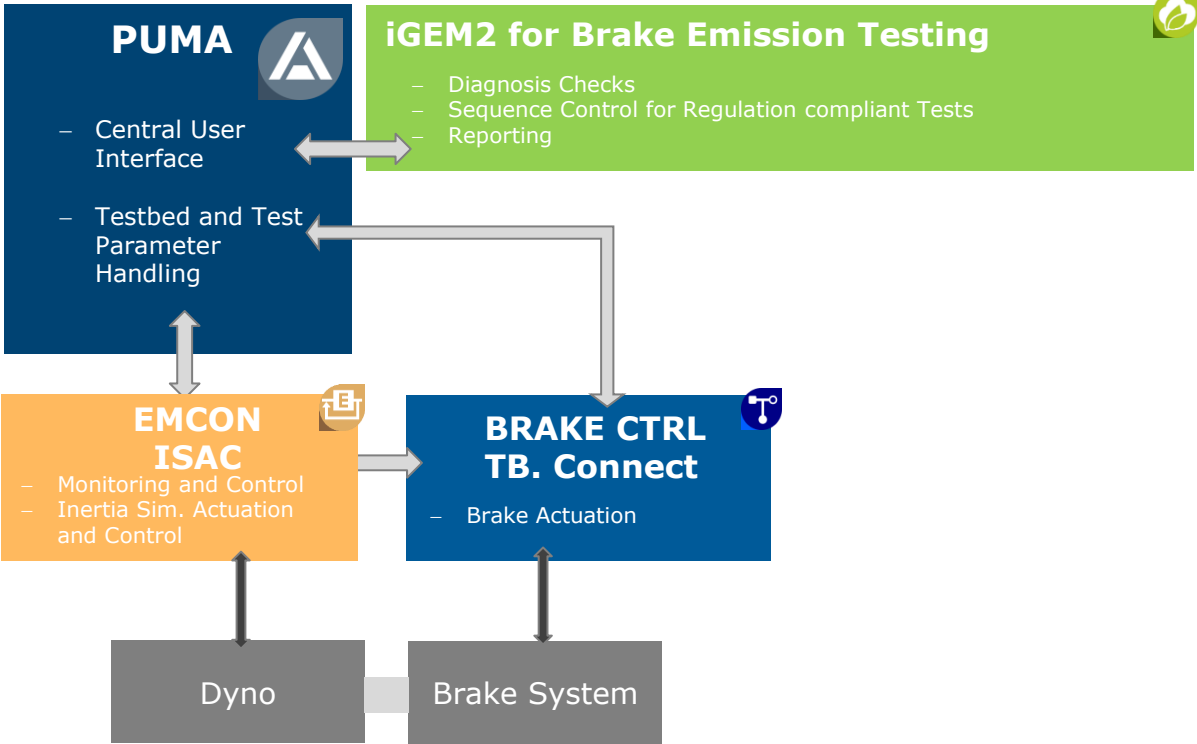


Automation & Control Software

Control Mode: Dyno Speed / Brake System Torque



Automation & Control Software





AUTOMATIC



MANUAL



MONITOR



STOP



Shutdown

iGEM 2™ Pre Test Dialog (ManualDataEntry.MDE)

Overview



AVL iGEM 2™ for Brake Wear Testing

Test

Cycle Definition

Cycle **WLTC Brake Emissions Measureme**

Limit/Procedure

Phase Count **10**

Additional

General Options

- ☐ Pre-Test Measurement
- ☐ Generate Report after Test
- ☐ Run as blank test

Additional Recorders

Operator Data

Operator **AVL**

Engineer

Brake & Vehicle

Datasheet

Brake

Data

Manufacturer **AVL**

Model **4783_ceramic**

Orientation **CCW viewing through driveshaft**

Duct Diameter **150**

Vehicle Data

MRO **1529.1 kg**

Shifting

Transmission **Manual**

Type **Static**

Gear Shift Profile **BrakeCycle**

Measurement options

Device Checks

☐ Leak Check ☐ PNC Resp. Check

☐ MS Zero Check ☐ Active brake cooling **No**

Ambient Snapshot

☐ AVL489

☐ AVL489_10nm

☐ EEPS

Devices

Configuration

Chassis Dyno Controller 1 device(s)

☐ VirtualChassisDynoController **Chassis Dyno Control**

Particulate Count 3 device(s)

☐ AVL489 **Brake Wear**

☐ AVL489_10nm **Brake Wear**

☐ EEPS **Brake Wear**

Particulate Matter 2 device(s)

☐ AVLBW1 **Brake Wear**

AVLBW1

Primary Flow **0.000 l/min**

Demand Probe **ECE**

Filterholder

AVLBW2

Primary Flow **0.000 l/min**

Demand Probe **ECE**

Filterholder

AVL489

Particle Reduction **100**

AVL489_10nm

Particle Reduction **100**

EEPS

Particle Reduction

CSA

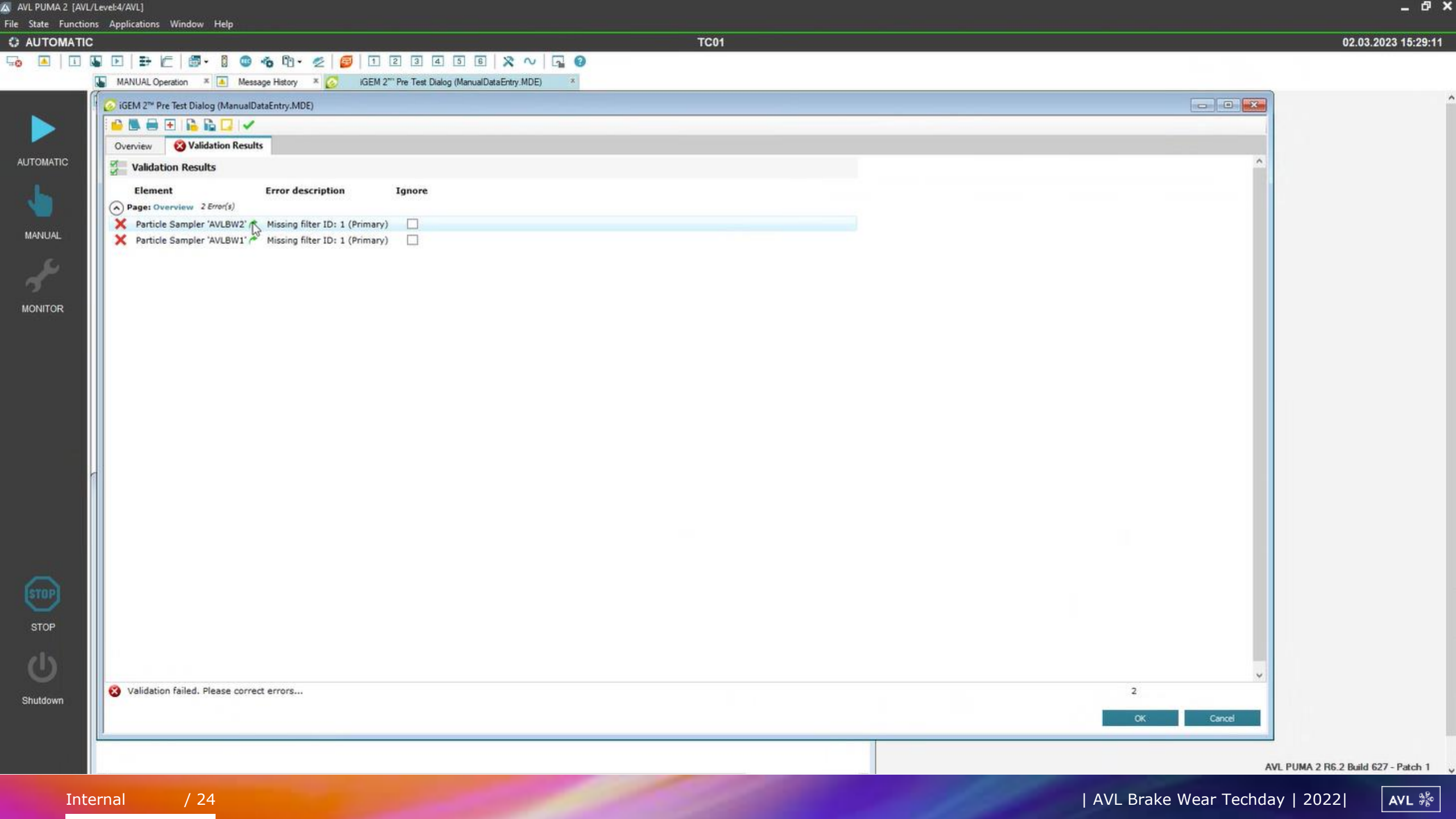
Volume Flow **1600.00 m³/h**

Temperature **25.20 °C**

Humidity **65.00 %** Pressure **100.00 kPa**

OK

Cancel



MANUAL Operation

Message History

iGEM 2™ Pre Test Dialog (ManualDataEntry.MDE)

iGEM 2™ Pre Test Dialog (ManualDataEntry.MDE)

Overview Validation Results

Validation Results

Element	Error description	Ignore
Page: Overview 2 Error(s)		
Particle Sampler 'AVLBW2'	Missing filter ID: 1 (Primary)	☐
Particle Sampler 'AVLBW1'	Missing filter ID: 1 (Primary)	☐

Validation failed. Please correct errors...

2

OK Cancel

AUTOMATIC

MANUAL

MONITOR

STOP

STOP

Shutdown

MANUAL Operation

Message History

iGEM 2™ Online View

MANUAL Operation

Step 0

Step type

Tolerance monitoring timeout

Tolerance check

Start mode

Control mode ☒ Ignition

Demand channels

General

Controller

Gear

Stepspecific Limits

Bitout 16

Phase 0

Message History

History

Pending

CDH

Raised

2023-03-02 15:29:32.389

2023-03-02 15:29:32.404

2023-03-02 15:29:32.449

2023-03-02 15:29:33.032

2023-03-02 15:29:33.063

2023-03-02 15:29:33.230

2023-03-02 15:29:33.263

2023-03-02 15:29:33.285

2023-03-02 15:29:35.517

2023-03-02 15:30:07.609

2023-03-02 15:30:09.215

2023-03-02 15:30:12.838

2023-03-02 15:30:16.173

2023-03-02 15:30:16.463

2023-03-02 15:30:16.918

DSTBlock.EMA_DST_Hig...

DSTBlock.EMA_DST_Che...

DSTBlock.EMA_DST_Bag...

DSTBlock.EMA_DST_Hig...

DSTBlock.EMA_DST_Che...

One channel or one channel filter must be defined.

One channel or one channel filter must be defined.

One channel or one channel filter must be defined.

One channel or one channel filter must be defined.

One channel or one channel filter must be defined.

iGEM 2™ Online View

Pre Test Dialog

✓ Select Settings

Store Data

Device Prepare

✓ Create Flow-Stream...

Generate Cycle

Generate SSQ...

✓ Basic Settings (Diluted)

Recorder/MRQ Setup

Leak Check (Diluted)

PNC Response Check (Dilu

Set Ready for Start

Cycle Execution

Finishing Devices

SSQ: | Steps: | Step: | | Step time:

Step time 10.00 0.00 s

Waiting time: 0.00 s

0 s

0.00 s

Stabilization

Evaluation

	Min. val.	Max. val.	Std. dev.	Unit
*****	*****	*****	*****	%
*****	*****	*****	*****	mbar
*****	*****	*****	*****	°C
*****	*****	*****	*****	m³/h
*****	*****	*****	*****	°C
*****	*****	*****	*****	l/min
*****	*****	*****	*****	-
*****	*****	*****	*****	-
*****	*****	*****	*****	p/cm³

Abort Store Results F8 Snapshot F9

Cleared

AVL iGEM 2™
ENERGY & EMISSION
TESTING, SIMPLIFIED

AVL PUMA 2 R6.2 Build 627 - Patch 1

The screenshot displays the AVL PUMA 2 software interface, which is divided into several functional areas:

- CDH Panel:**
 - Header:** CDH
 - Sub-header:** EEPS
 - User/Status:** User: Remote, Status: Measure
 - Main Display:** Conc. CPC, 1235.000 #/cm3
 - Bottom Table:**

Error	0.00 -
+Charger	1.00 -
-Charger	1.00 -
HiVolt	0.00 -
VoltOffset	0.00 -
SheathFlo	1.00 -
SampleFlo	***** l/min
- AVLBW Panel:**
 - Header:** AVLBW
 - Sub-header:** AVLBW1
 - User/Status:** User: Remote, Status: Measurement
 - Main Displays:**
 - PressureFilter: -26.000 mbar
 - TemperatureExhaust: 22.500 °C
 - TemperatureInlet: 29.000 °C
 - VolumeFlowProbe: 5.030 l/min
- Functions Panel:** Located on the right side, currently empty.
- Disabled devices Panel:** Located on the right side, showing 'VirtualChassisD'.
- Status Bar:** AVL PUMA 2 R6.2 Build 627 - Patch 1

Emission Manager Reports





1

2

3

4

5

6

AVL Brake Emission Test Systems



- Die bevorstehende Gesetzgebung erfordert eine erhebliche Steigerung des Prüfaufwands für Bremsen.
- Die Emissionsmessung ist eine neue Herausforderung für Bremsenentwickler und erfordert spezifisches Wissen und Know-how.
- Durch die Kombination von Emissionsmessungsexpertise und Prüf-Know-how kann AVL mit umfassenden integrierten Lösungen unterstützen.
- AVL bietet die Umwandlung bestehender Testinfrastrukturen, wie z.B. Motorenprüfstände, zu Bremsenemissionstests an.

Vielen Dank!

www.avl.com

AVL





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