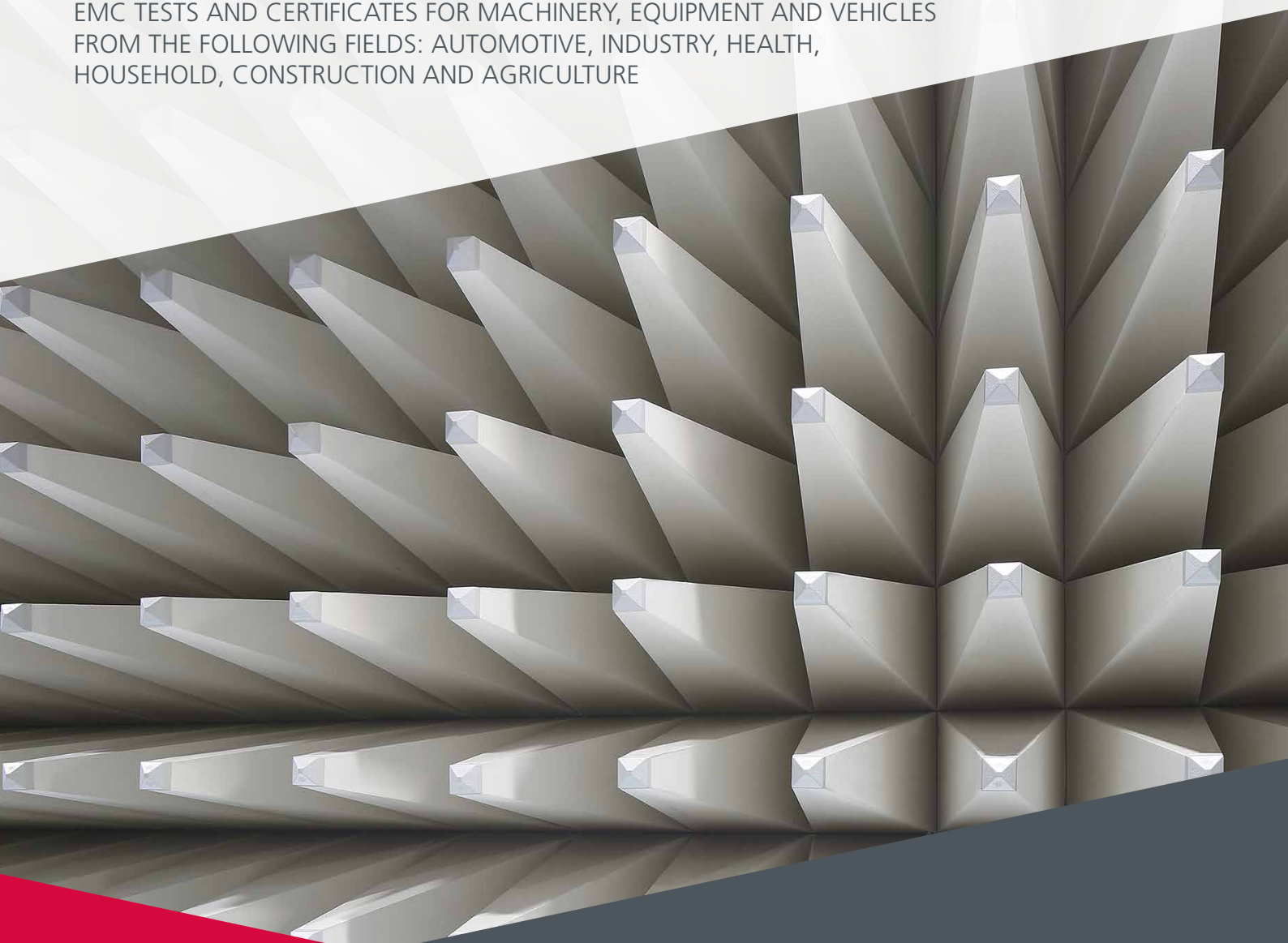
EMC-CENTER FULDA

EMC TESTS AND CERTIFICATES FOR MACHINERY, EQUIPMENT AND VEHICLES FROM THE FOLLOWING FIELDS: AUTOMOTIVE, INDUSTRY, HEALTH, HOUSEHOLD, CONSTRUCTION AND AGRICULTURE



EDAG

EMC – MORE IMPORTANT THAN EVER!

The increasing complexity of many vehicles is giving rise to increasing numbers of electric components, the electromagnetic fields of which could influence the way in which other components in the vehicle work. This also applies to industrial products, medical equipment and all other technical areas in which electronic systems are used. To ensure that they function correctly, are EMC measurements more important than ever.

What this means for industries is that they have to develop complex test scenarios and need state-of-the-art measuring technology - above all measuring capacities - in order to be able to carry out the many different tests.

EDAG has numerous test and measuring laboratories in Germany and, on account of increasing demand, is building a large new EMC test center in Fulda, in the heart of Germany, in 2023. In all, this will provide two anechoic chambers, three absorber chambers and a shielded chamber. For vehicles and equipment systems, there is a turntable with a 9-meter diameter and integral roller dynamometer.

State-of-the-art test procedures will be implemented in this new test laboratory. Entire vehicles (passenger vehicles, trucks), large-scale equipment for the construction industry, agricultural machinery, their individual components and their resilience to other electrical or electromagnetic interference factors from the vehicle itself or the electromagnetic environment will be analyzed. Industrial and medical technology products are also to be included in the test portfolio.

This brochure will give you a detailed outline of just what the EMC Test Center at EDAG's headquarters can do.

SCAN NOW
for the interactive
AR TESTCENTER

THE LABORATORIES AT THE EMC TEST CENTER

The new EMC Test Center is located at the very heart of both Germany and Europe, and, being right on the A7 and close to the A66 in the direction of Frankfurt, has ideal transport links. This is a neutral location and not in the direct vicinity of any of the major vehicle manufacturers.

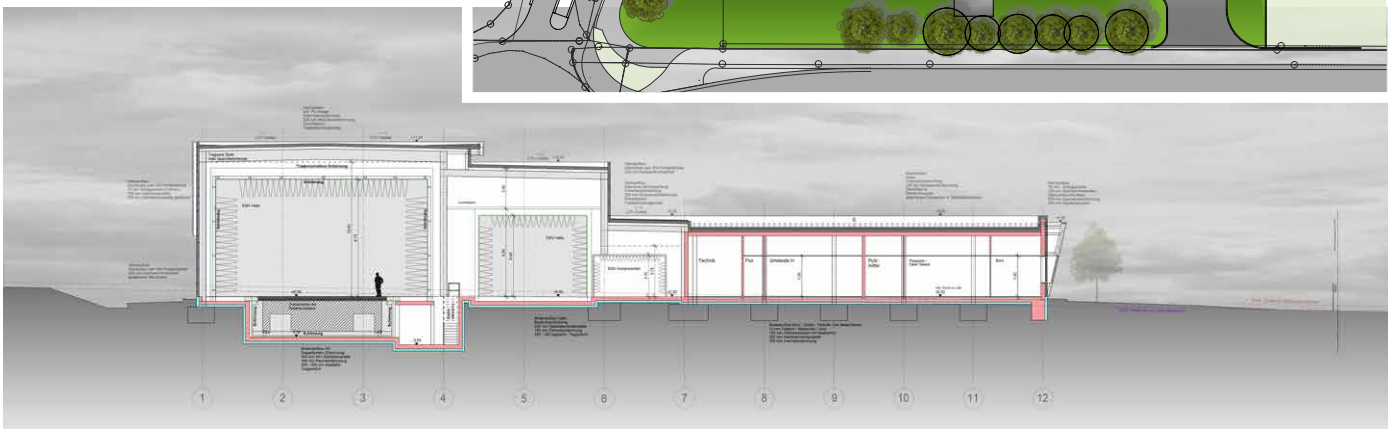
The large **SAC 10 anechoic chamber** with a turntable and roller dynamometer (436 kW / four-wheel mode) is available for trucks, agricultural vehicles, construction machinery and passenger vehicles. The turntable has a diameter of 9 meters and can carry up to 5 tons per axis. Emission and immunity testing can be carried out in this hall.

The second **anechoic chamber, SAC 5**, has a 3-meter turntable, a high-performance blue box (power: 120 kW) and a maximum load of 5 tons.

In addition to the two large anechoic chambers, there are also three smaller **ACTC cabin** and a **shielded chamber.**

The EMC-Center will be certified to TISAX standard and ensure all customers maximum data security and prototype protection. As a result of this certification and the accreditation in accordance with DIN/ISO 17025, it will provide approved test results for all OEMs and suppliers in the automotive industry.

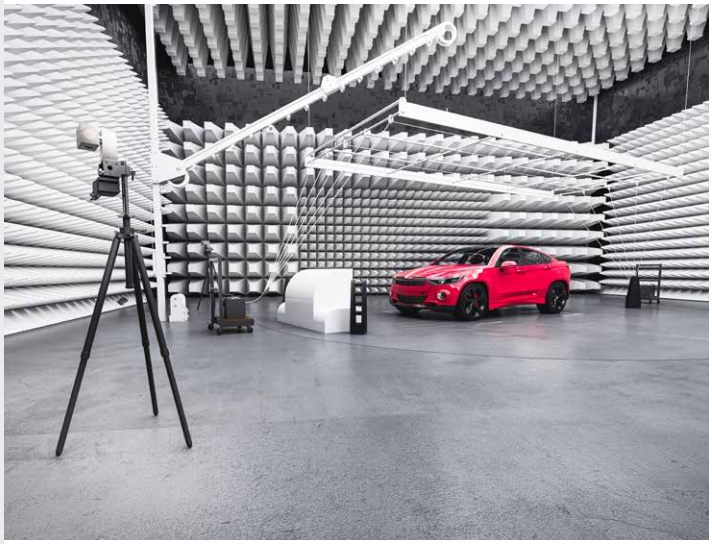
EDAG is able not only to test equipment and vehicles, but also to develop the test procedures and test setups for customers. To do this, the EMC-Center has trained staff and engineers with practical experience.



ANECHOIC CHAMBER SAC 10V-6/H

Anechoic chamber for emission and immunity testing

External dimensions (L x W x H)	22.5 m x 15.6 m x 8.7 m
Dimensions of sliding door	4.8 m x 4.8 m
Measuring track	3 m, 5 m, 10 m
Turntable diameter	9 m
Roller testing bench	
Load	5 t per axis
Power	218 kW per axis
	436 kW in four-wheel mode
Vehicle tests in line with	ECE R10
	CISPR 12 / 16-1-4 / 25 Ed. 4
	IEC/EN 61000-4-3
	ISO 11451
DC charging unit	
Voltage	50 V – 1000 V
Current	600 A
Power	300 kW



SHIELDED CHAMBER

Shielded chamber for emission and immunity testing

External dimensions (L x W x H)	6.3 m x 3.9 m x 3.0 m
Dimensions of door	1.5 m x 2.1 m
ESD generator	
Test voltage	max. ±30 kV
Discharge networks	150 pF / 2000 Ω
	330 pF / 2000 Ω, 330 Ω
Component tests in line with	CISPR
	ISO 11452
	ISO 10605
	IEC 61000-4-2
	IEC 61000-4-4
	IEC 61000-4-5

ANECHOIC CABIN ACTC

Anechoic cabin for emission and immunity testing

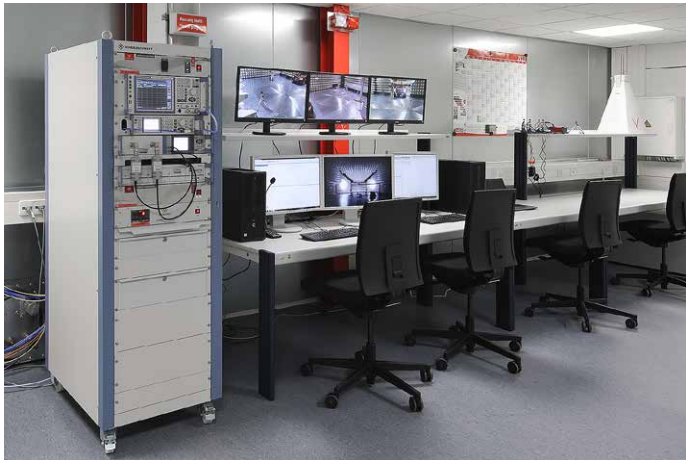
External dimensions (L x W x H)	6.3 m x 5.4 m x 3.7 m
Dimensions of door	1.5 m x 2.1 m
Measuring track	1 m
Component tests in line with	CISPR 25 Ed. 4
	ISO 11452

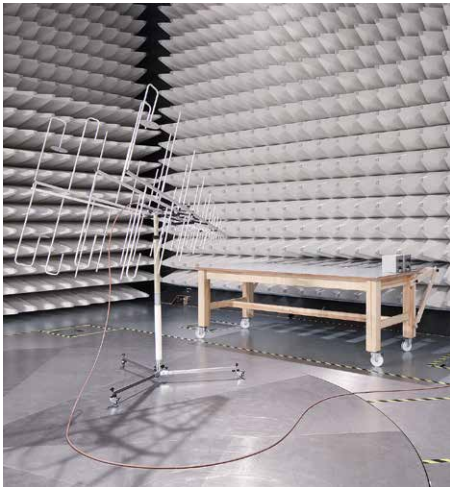
ANECHOIC CHAMBER SAC-5

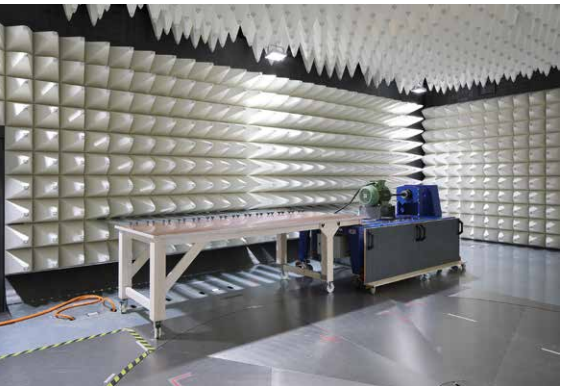
Anechoic chamber for emission and immunity testing

External dimensions (L x W x H)	12.6 m x 8.1 m x 6.0 m
Dimensions of sliding door	3.0 m x 3.0 m
Measuring track	1 m, 3 m, 5 m
Turntable diameter	3 m
Maximum load	5 t
Blue box	
Power	120 kW
Maximum speed	6000 rpm
Minimum torque	470 Nm
Maximum load	1,400 kg
Vehicle tests in line with	CISPR 12 / 16-1-4 / 25 Ed. 4
	IEC/EN 61000-4-3
	ISO 11452

EDAG EMC-CENTER



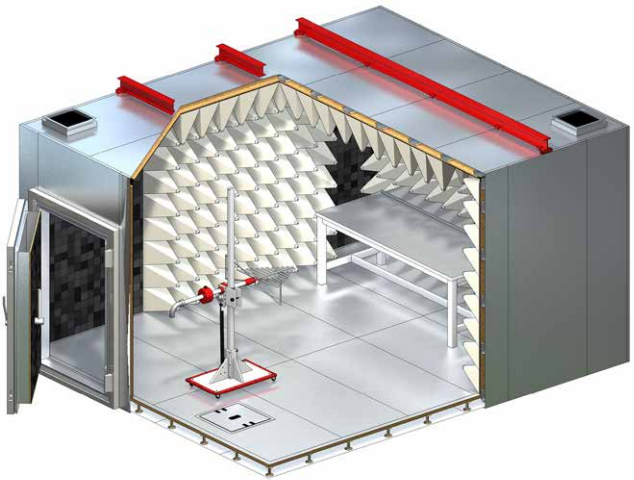




TEST EQUIPMENT & CERTIFICATES

The EMC Test Center is fitted with state-of-the-art test equipment of well-known manufacturers, mainly of global EMC market leaders Rohde & Schwartz, Frankonia and AMETEK, by means of which passenger vehicles, trucks, agricultural machinery, domestic appliances, consumer electronics, medical equipment and much more can be tested in accordance with the statutory standards.

The testing standards applied by the EMC Test Center are not restricted to Germany only. As an internationally positioned company, EDAG can also test equipment in accordance with international standards and provide legally compliant certification in Fulda.



EXAMPLES OF TESTING STANDARDS

ECE R10 An electromagnetic compatibility test for vehicles (Regulation 10, EMC interference suppression) and part of the UN/ECE for vehicles. This applies to vehicles for registration in North America, Europe, North Asia (not China).

CISPR 12, 16, 25 The CISPR publications deal with standardized disturbance measurement methods of electromagnetic disturbance. Numbers 12 and 25 refer to vehicles, boats and integrated combustion engines, 16 to radio interference more generally. Parallel to these, there are also European standards (EN 550xx) and DIN standards (DIN VDE 0879-1 and -2).

IEC/EN 61000-4-3 This standard describes the testing of the immunity of electrical and electronic devices (equipment) to high-frequency electromagnetic fields, and also specifies the general conditions for the test process and setup.

ISO 11451 Specifies vehicle tests to determine the immunity of passenger and commercial vehicles to electrical disturbances from narrowband radiated electromagnetic energy. The tests are carried out across a broad frequency range.

ISO 11452 This is a test method for testing electrical interference from electrostatic discharges and is used on vehicles and vehicle components. A wide variety of possible sources of interference are described and tested.

ISO 10605 This specification defines the electrostatic discharge (ESD) test methods necessary to evaluate electronic modules intended for vehicle use. Discharges can be caused during assembly, by service staff or by occupants.

IEC 60601-1 This international standard describes the method for testing the electromagnetic compatibility of medical equipment. It is supplemented by numerous additional sub-standards. The preparation of a new edition is to begin in 2023.

"THERE IS HUGE DEMAND"

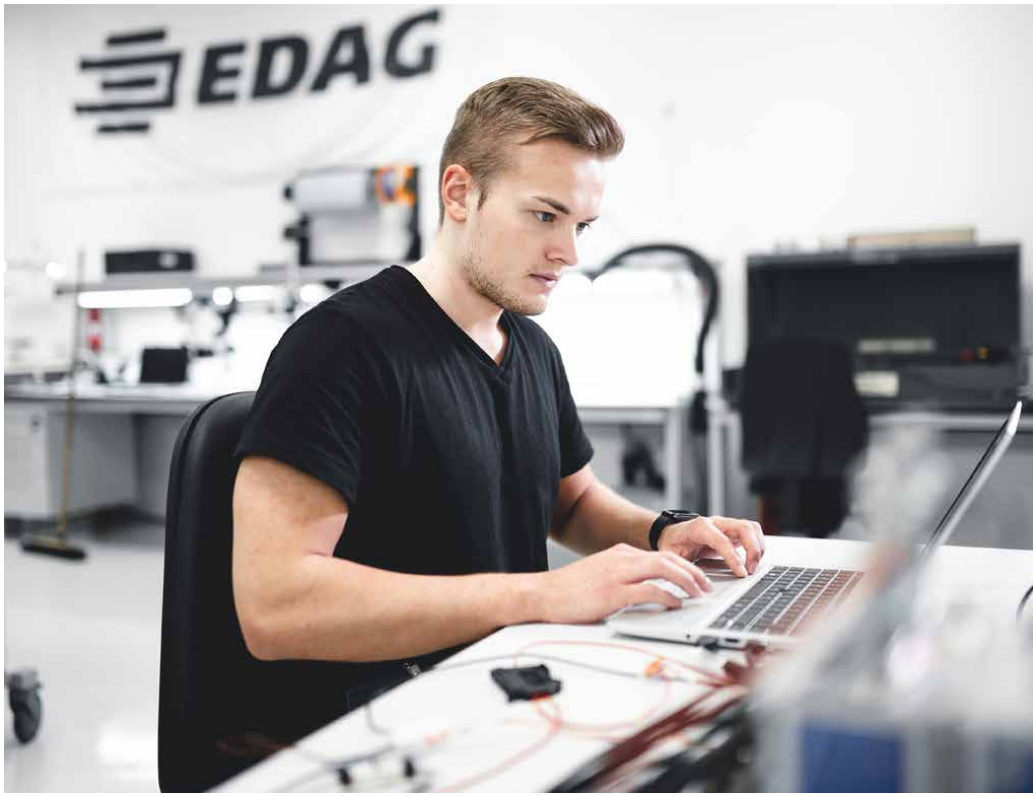
BUILDING A LARGE EMC LABORATORY CALLS FOR KNOW-HOW, HEAVY INVESTMENT AND A SENSE FOR TRENDS AND MARKET DEVELOPMENTS. IN THE INTERVIEW, CHRISTIAN WALTER, OVERALL PROJECT MANAGER OF THE NEW EMC CENTER, AND TEAM LEADER MICHAEL DOMBROWSKI EXPLAIN THE SPECIAL FEATURES OF THE NEW TEST CENTER AND ITS ADVANTAGES FOR CUSTOMERS.

Mr. Walter, what are your feelings when you see the way the new center is expanding? Pleasant anticipation, impatience about when you can finally get started, or are you still worried about how everything will work?

Walter: I am filled with anticipation, also because it is an exciting, future-oriented subject, and it is of course fun to develop something new and then watch it grow. In addition, the first customers have already announced their requirements.

And since you ask: no, we are not worried. Despite the sometimes difficult weather conditions, we are making good progress and building work is still ahead of schedule. Also, the cooperation between our suppliers - Rohde & Schwarz, Frankonia und AMETEK - and the departments at EDAG is very good indeed.

Customer acquisition will therefore be starting from July 2023, as planned, and laboratory operations in the second quarter of 2024.



Where did you get the idea to build a new test center from?

Walter: EDAG already has six testing sites (environmental simulation, shaker, electrical testing) in operation throughout Germany. Due to the increasing number of electrical components in vehicles, more and more EMC-related enquiries were being received. For us, this was the starting point, when we decided to pay greater attention to EMC testing and address this need.

Was it difficult to convince your company management of the need?

Walter: It is, of course, always difficult to convince those in charge to make a two-figure million investment. We had, however, carried out professional market research beforehand. The indicated that there was a global market volume of more than € 2 billion (EMC testing market study). In the automotive sector in Germany, the annual market volume is about € 500 million – and and this is expected to grow by about 5 % a year. So potential is there.

What tipped the scales in favor of building the EMC-Center in Fulda, opposite the head office?

Walter: The position more than anything. Fulda is positioned more or less in the center of Germany has excellent links to the road network in every direction. Also, Fulda is a neutral site for all vehicle manufacturers.

You might expect every major vehicle or medical equipment manufacturer to already have an EMC center. Mr. Dombrowski: What are the special features of the new EMC-center, and what can EDAG do there that others cannot?

Dombrowski: For one thing, the new EMC laboratory will be a neutral test laboratory accredited according to DAkkS standards and equipped with state-of-the-art technology. For another, customers will have the advantage of taking the pressure off their own EMC test capacities, which are generally already being utilized to the full. They will be able to order the testing services they require from us as services.

What technical areas are the laboratories geared to? Is it aimed just at automotive engineering, or what other sectors are you addressing with the EMC Test Center?

Dombrowski: The test center has been designed to enable us to test a wide variety of equipment and machinery. This includes cars and trucks on the one hand, but also tractors and agricultural machinery, industrial machinery and, of course, domestic appliances and household electronics on the other. Although traditionally we have close connections with vehicle manufacturers, we are already receiving inquiries from the medical sector.

So what are the largest machines that will fit on the turntable and through the doors?

Dombrowski: Well, the largest gate has an opening measuring 4.8 meters in both height and width. Vehicles weighing up to 5 tons per axle are allowed on the roller dynamometer. This means you can have trucks but also a combine harvester tested at our center. The heavy load area outside of the turntable can take loads of up to 20 tons.

How do you see the technical development: Will it be more difficult and complex (and therefore more expensive) for

customers to develop and validate their vehicles, equipment and machinery in line with EMC standards in the future?

Dombrowski: That depends on the number of systems installed. The more you install, the more you need to test. As the degree of electrification in vehicles is constantly increasing, the need for corresponding system and component tests, including the appropriate approvals by a neutral laboratory, is also growing.

What does this type of measuring or certification project involve? What do the customers need to provide, and where can EDAG help?

Dombrowski: When it comes to the test options, we differentiate between development-related testing and approval testing at the end of a lengthy development. In the simplest case, the customer simply sends us components – our trained EDAG specialists then assume control and take over component operation during the test procedure, and then draw up the complete test report.

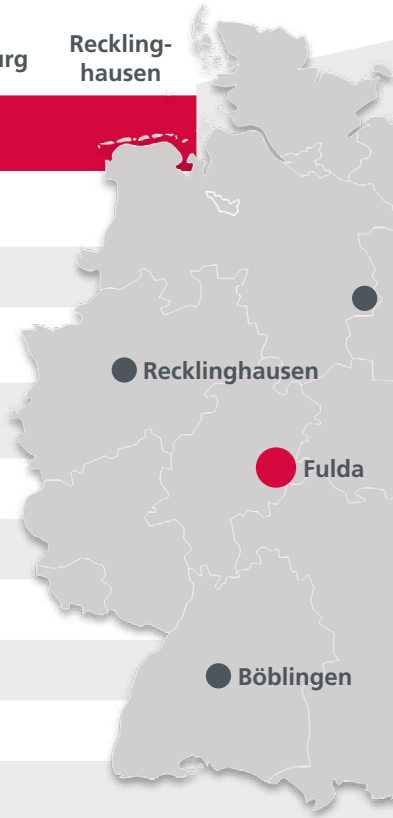
But, of course, the customer can also – especially during ongoing development – supervise testing on site and liaise with our engineers.

When can the first EMC tests be carried out in Fulda? And a matter of extreme importance to potential customers: Are you already fully booked or can you still accept orders?

Walter: We are, of course, already involved in initial talks with potential customers and further talks are also being planned. Our sales team is already active and attending trade fairs. However, definite order scheduling will not begin until the final quarter of 2023, so it is still too early to be talking about capacity utilization.

EDAG TESTING GERMANY
LIST OF SERVICES

Services	Böblingen	Ingolstadt	München	Fulda	Wolfsburg	Reckling-hausen
EMC-Center				•		
Climate test (environmental simulation)	•	•	•	•	•	
Vibration test (shaker)	•	•	•	•	•	
Operational strength		•	•		•	
Testing interior/exterior (function and service life)	•	•	•	•	•	
Materials testing				•		
NVH/Acoustics		•	•			
3D metrology	•	•	•	•	•	
Vehicle safety testing	•	•	•		•	
Testing braking systems			•			
Testing seating systems			•			
Testing tank systems*	•	•	•			
Testing of air conditioning components*		•				
Testing electrics/electronics*		•	•	•	•	
Test bench development / construction**						•
Testing engineering***	•	•	•	•	•	



* Special components

** Test facility construction

*** Engineering and control services

ABOUT EDAG

As a German engineering company with more than 8,000 employees, EDAG specializes in vehicle and production plant development and production. The company offers a wide range of services including design, development, simulation, prototyping, testing and project management. EDAG works with customers from the automotive industry and from other sectors such as aerospace, medical technology, energy and mechanical engineering. The company was founded in 1969 and has its headquarters in Wiesbaden, Germany.

EDAG offers its customers a wide range of testing services. These include:

Function and system testing: The functions and systems of the product which is to be tested are checked to assess their effectiveness and conformity with the customer's specifications.

Crash tests: To test the safety of vehicles and other products, we can carry out both virtual and physical crash tests.

Environmental tests: We can check how products perform under different environmental conditions, e.g. temperature, humidity, salt spray, vibrations and impact loads.

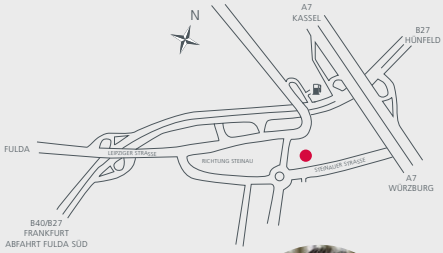
Electrical and electronic tests This involves testing the electrical and electronic components and systems of vehicles and other products to ensure that they meet safety, reliability and performance requirements.

Acoustic tests: EDAG also offers tests to assess the noise emissions of vehicles and other products to ensure that they comply with legal regulations and customer requirements.

In order to provide the customer with all-round product development and optimization support, these testing services can be combined with EDAG's engineering services.

WHO TO CONTACT

EMC-CENTER FULDA



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