



MOOG PITCH CONTROL TRAINING

HELPING TO ENHANCE PERFORMANCE AND
MAXIMIZE AVAILABILITY OF WIND TURBINES

Moog designs, manufactures and supplies high performance electric, hydraulic and hybrid motion control solutions for many industrial applications. For the wind energy sector, we design and manufacture pitch systems, slip ring solutions, blade sensing and rotor monitoring systems that are used around the globe. Thanks to our innovative technology and commitment to solving our customers’ challenges, we ensure the maximum performance and efficiency even in extreme climatic conditions. We set the standards in both onshore and offshore applications, offering tailored solutions to meet the specific requirements of wind energy professionals everywhere.

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MAXIMUM TURBINE PRODUCTIVITY STARTS WITH EDUCATED EMPLOYEES

Over 25,000 Moog Pitch Systems and Pitch Products have been installed in onshore and offshore wind turbines worldwide. These are high performance systems and products that require specific expertise from commissioning to repair to troubleshooting.

Because technical know-how and skills are a prerequisite for optimized operation, Moog offers a broad selection of training courses. At the Moog Wind Training Center in Unna, Germany, the courses we offer provide insights as well as hands-on technical knowledge. All courses focus on the maintenance, performance analysis, repair and retrofit of Moog Pitch Systems and Products. The training center has been established to serve the training needs of our customers globally. We can accommodate training in English, German and other languages.

To ensure the optimum operation of a wind turbine, you need experienced service engineers who know what to do in the event of a failure and are trained to maximize uptime. Technical know-how is essential and engineers must be able to assess the condition of a wind turbine and take necessary actions to guarantee the turbine's availability and performance. In hard-to-reach areas and conditions that are difficult to work under, it is important to minimize on-site deployment and coordinate any required work upfront. This requires highly qualified technicians, and Moog's training courses will help you more effectively achieve this goal.

Success through technical training

- Qualified service engineers will be able to manage deployment on their own
- Trained service staff will help speed up repair and maintenance work and maximize uptime
- The turbine's availability is optimized through better planning and optimized performance
- The quality of deployment of internal staff is optimized, saving you costs

This catalog is designed to showcase the many courses we offer across all areas of wind turbine pitch control and provides a form to register for courses. Further information and assistance is always available through the contact information on the registration form.



Moog's Wind Training Center in Unna, Germany

PRACTICAL TRAINING TO HELP YOU ENHANCE YOUR SKILLS

The dynamic nature of the wind energy business with its ever-changing technology and systems means that you are constantly faced with new challenges and must also make continuous adjustments to processes and procedures. Training is a critical factor to success.

Moog experts conduct training on a full range of topics related to technology and business issues—all tailored to specific roles within your organization:

Engineers

Moog courses provide a detailed overview of Pitch Systems and Pitch Products for design, application and other types of engineers involved in wind turbine design and performance.

Technicians

Training courses for technicians provide the participants with methods and tools to help them solve issues on site, skills to take preventive action and in-depth technical knowledge about Moog's products and systems.

General staff

Training courses for general staff provide a basic technical understanding and insights into wind energy and Moog's products for new employees or employees in other disciplines.

Topical technical knowledge is taught in an inspiring learning atmosphere in a straightforward, easy-to-understand manner. Our experienced professionals

understand the participants' need for knowledge that is applicable to their day-to-day work and will tailor the course to meet individual requirements. Trainees can combine several training courses or design his or her own personal training package.

Scope of training

Typical training topics include:

- Pitch Systems
- Pitch Products
- Use of tools
- Testing and adjustment
- Planning of maintenance work
- Systematic troubleshooting

We offer courses in German and English. If you wish courses in other languages, please contact us.

Achieving success with Moog

Moog Pitch Control Training courses offer a variety of key benefits to wind energy professionals including:

- Practical work and theoretical training at one location
- All systems and components available for hands-on instruction
- Trainers with years of experience and a wealth of expertise
- Special company-specific training programs
- Immediate practical application
- Small training groups provide more opportunity for interaction with Moog trainers



IN-DEPTH TRAINING COURSES THAT COVER ALL AREAS OF PITCH CONTROL

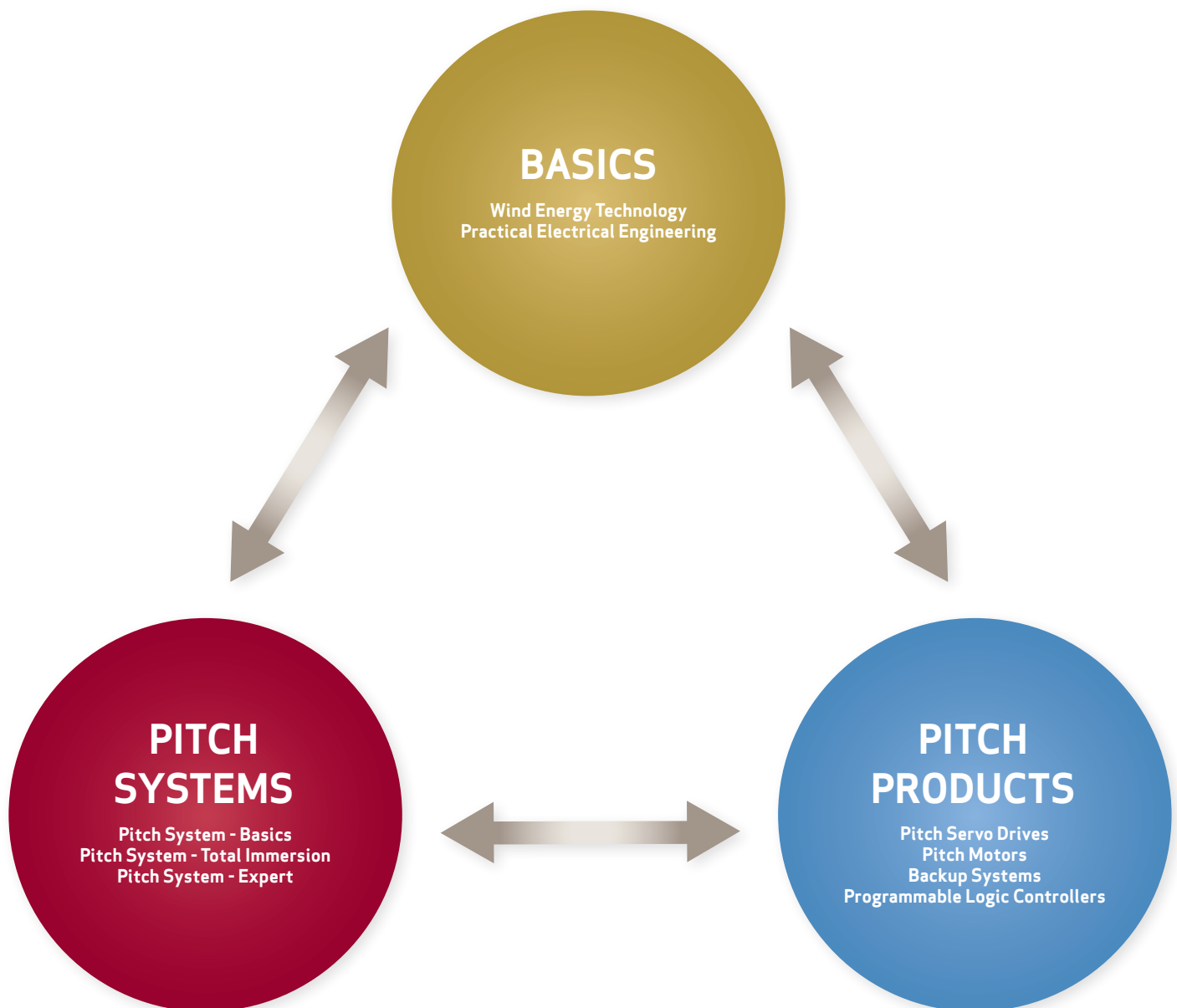
The following pages provide individual overviews of the various courses available at the Moog Wind Training Center. The courses are organized in three sections.

- Section one covers the basics of wind turbine technology.
- Section two focuses on Pitch Systems.
- Section three provides a variety of courses covering individual products within a Pitch System.

Feel free to combine courses over several days to optimize your travel expenses.

Information on enrollment, logistics and accommodations is found starting on page 11.

Moog Pitch Control Training Courses



1 | BASIC TRAINING COURSES

1.1 WIND ENERGY TECHNOLOGY

The objective of this class is to provide people who are new to this field with their first introduction to wind energy technology and the design of a wind turbine. You will be introduced to the major components including the Pitch Servo Drive, gear, Pitch System and the connection with the control system. In addition, you will learn about the grid connection of wind turbines.

Target group

- Industry newcomers

- The basics of the major products
- Grid connection

Number of attendees

- Maximum: 12

Duration

- One day

Content

- Introduction to wind energy technology
- The function of a wind turbine

Assessment

- Certificate of attendance

1.2 PRACTICAL ELECTRICAL ENGINEERING – BASICS

Step by step, beginners with no previous knowledge are introduced to the theory of electrical engineering, and the basics are explained in a descriptive manner. You will acquire sufficient basic knowledge of electrical engineering to enable you to perform basic work and read circuit diagrams. In addition, you will be introduced to the function and use of major products.

Target group

- Beginners
- Industry newcomers

- Reading and interpreting circuit diagrams
- Introduction to related equipment
- Introduction to measuring equipment

Number of attendees

- Maximum: six

Duration

- Two days

Content

- Safety information
- Circuit set-up

Assessment

- Examination
- Certificate of completion



2 | PITCH SYSTEM TRAINING COURSES

2.1 PITCH SYSTEM - BASICS

In this basic training, the set-up and function of Pitch Systems is explained. In addition, issues related to the security, availability and efficiency of wind turbines and their interrelation with Pitch Systems are addressed. After the course, you will be able to operate and maintain them.

Target group

- Service engineers
- Mechanical, Electronics and Mechatronics Technicians
- Production staff
- Test field staff

Prerequisites

- Basic knowledge of electrical engineering (training course 1.2 or comparable previous knowledge)

Number of attendees

- Maximum: six

Content

- Functions of pitch systems
- System variants/box systems
- Pitch Servo Drives
- Pitch Servo Motors

Duration

- Three days

Assessment:

- Examination
- Certificate of completion

2.2 PITCH SYSTEM - TOTAL IMMERSION

This seminar is focused on providing theoretical and practical knowledge of blade pitch control. It is intended for people who wish to refresh their basic knowledge or deepen their expertise. The seminar also includes an introduction to various operating software programs. You will learn how to perform in-depth fault analysis and resolve problems.

Target group

- Service engineers
- Mechanical, Electronics and Mechatronics Technicians
- Production staff
- Test field staff

Prerequisites

- Basics in electrical engineering (training course 1.2 or comparable previous knowledge)
- Practical experience

Number of attendees

- Maximum: six

Content

- Extended functionality of component software
- Detailed fault finding and analysis on Pitch Systems
- Component analysis

Duration

- Two days

Assessment

- Examination
- Certificate of completion

2 | PITCH SYSTEM TRAINING COURSES CONTINUED

2.3 PITCH SYSTEM – EXPERT

This training course will deepen your knowledge on how to enhance performance and optimize operation of Pitch Systems. It will offer fresh approaches and provide practical suggestions for improvements in your system. You will deepen your knowledge of the major areas and will learn about current and state-of-the-art developments.

Target group

- Developers
- Software programmers

Prerequisites

- Programming knowledge
- Practical experience

Number of attendees

- Maximum: three

Content

- Analysis of Pitch System signals
- Integration into the communication system with the control computer

- Control system performance
- Bus configuration and description
- Electromagnetic compatibility
- Basics of control technology

Duration

- One day

Assessment

- Examination
- Certificate of completion



3 | PRODUCT TRAINING COURSES

Product training courses provide a detailed explanation of the different products of a Pitch System, including their functionality. You will be able to plan maintenance intervals, handle potential problems, repair and replace products in an expert manner.

Target group

- Service engineers
- Mechanical, Electronics and Mechatronics Technicians
- Production staff
- Test field staff

3.1 PITCH SERVO DRIVES (EARLIER MODELS/VERSIONS)

Prerequisites

- Practical experience would be an asset

- Parameterization
- Fault analysis

Number of attendees

- Maximum: six

Duration

- One day

Content:

- Operation of all basic functionality
- Handling software oscilloscopes
- Operating software

Assessment

- Examination
- Certificate of completion

3.2 PITCH SERVO DRIVE PITCHMASTER

Prerequisites

- Practical experience would be an asset

- Parameterization
- Fault analysis

Number of attendees

- Maximum: six

Duration

- One day

Content

- Operation of all basic functionality
- Handling software oscilloscopes
- Operating software

Assessment

- Examination
- Certificate of completion

3.3 PITCH SERVO DRIVE PITCHMASTER II/II+

Prerequisites

- Practical experience would be an asset

- Parameterization
- Fault analysis

Number of attendees

- Maximum: six

Duration

- One day

Content

- Operation of all basic functionality
- Handling software oscilloscopes
- Operating software

Assessment

- Examination
- Certificate of completion

3 | PRODUCT TRAINING COURSES CONTINUED

3.4 PITCH MOTORS

Prerequisites

- Technical understanding

Number of attendees

- Maximum: six

Content

- Design of AC and DC motors
- Series connection and composite connection, synchronous and asynchronous design

- Characteristics
- Fault analysis
- Analysis of encoder systems
- Warning signals

Duration

- Two days

Assessment

- Examination
- Certificate of completion

3.5 BACKUP SYSTEMS

Prerequisites

- Basic knowledge of electrical engineering (training course 1.2)

Number of attendees

- Maximum: six

Content

- Design and functions
- Capacitors and accumulators

- Fault analysis
- Monitoring functions

Duration

- One day

Assessment

- Certificate of attendance

3.6 PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

Prerequisites

- Practical experience
- Programming experience

Number of attendees

- Maximum: six

Content

- Basic functions
- Fault analysis
- User interface

Duration

- One day

Assessment

- Certificate of attendance



TRAINING LOGISTICS

Assessments

For selected training courses indicated, you will receive a certificate when you pass a final examination. For all other courses, you will receive a certificate of attendance.

Course fees

Course costs are available upon request. Many courses are customized and we offer multiple course packages. Training fees include training materials as well as food and refreshments (drinks, snacks and lunch).

Training course times

Training courses start at 8 am and end at 4 pm.

Dates

There is no fixed schedule of training dates. Dates are set up based upon an agreement between you and Moog. Please inquire.

Accommodations

The following hotels in the vicinity are recommended. Please take advantage of our special rates by mentioning Moog when you book a room.

Required tools

For training courses, you will need to bring a laptop with installation rights (except the courses Wind Energy Technology and Practical Electrical Engineering).

Please bring safety shoes for all training courses.

Specialized offerings

Upon request, we can provide individual training courses tailored to your systems and components. We also offer company-specific training programs. Please contact us to find out more.

For groups of four or more, we can offer tailored training courses on your premises.

Are you interested in training for Pitch Pumps, Pitch Valves, Slip Rings, Blade Sensing and Rotor Monitoring Systems? Please contact us.

Hotel	Contact	Information
Ringhotel Katharinen Hof Bahnhofstr. 49 59423 Unna Germany	Tel.: +49 (0) 2303 920-0 Fax: +49 (0) 2303 920-444 E-mail: katharinenhof@riepe.com www.riepe.com/en/hotels/unna	Family-run 4 star hotel, quiet, but central location in the city centre across the railway station, comprehensive buffet breakfast, complimentary WLAN.
Park Inn Kamen Karree 2 59174 Kamen Germany	Tel.: +49 (0) 2307 - 969 0 Fax: +49 (0) 2307 - 969 666 E-mail: kamen@eventhotels.com www.park-inn-kamen.de/default-en.html	4 star hotel with direct access to the motorways A1, A2, A44 and A45, comprehensive buffet breakfast.
AKZENT Hotel Gut Hoeing Ligusterweg 30 59425 Unna Germany	Tel.: +49 (0) 2303 96866-0 Fax: +49 (0) 2303 96866-50 E-Mail: mail@hotel-gut-hoeing.de www.hotel-gut-hoeing.de/en	Cottage style hotel, quiet situation without through roads. Prices include breakfast. 1.3 km from downtown Unna.

MOOG TRAINING REQUEST FORM

A formal quotation will be issued for the training program designed to meet your unique requirements. Your registration will be confirmed upon your acceptance of the quotation. Please use our pre-printed form for requests or copy this page, complete and return it to us. Fill out this form for each participant and send via mail, fax or e-mail. On-line registration is available at www.moog.com/wind_trainings

Training course number (e.g. 1.1, 1.2, etc.) _____

Name of participant _____

Job title of participant _____

Participant's areas of experience _____

E-mail address _____

Phone number / Mobile number _____

Company information / Invoice recipient _____

Training language ☐ German ☐ English

Ask us about other languages you may need.

For more information, contact:

Phone: +49 2303 5937-0

Fax: +49 2303 5937-198

E-Mail: training-wind@moog.com

Mailing Address: Moog Unna GmbH

Max-Born-Str. 1

59423 Unna, Germany

Website: www.moog.com/wind_trainings

The cancellation policies apply only for training that is confirmed upon acceptance of the quotation.

Cancellation terms

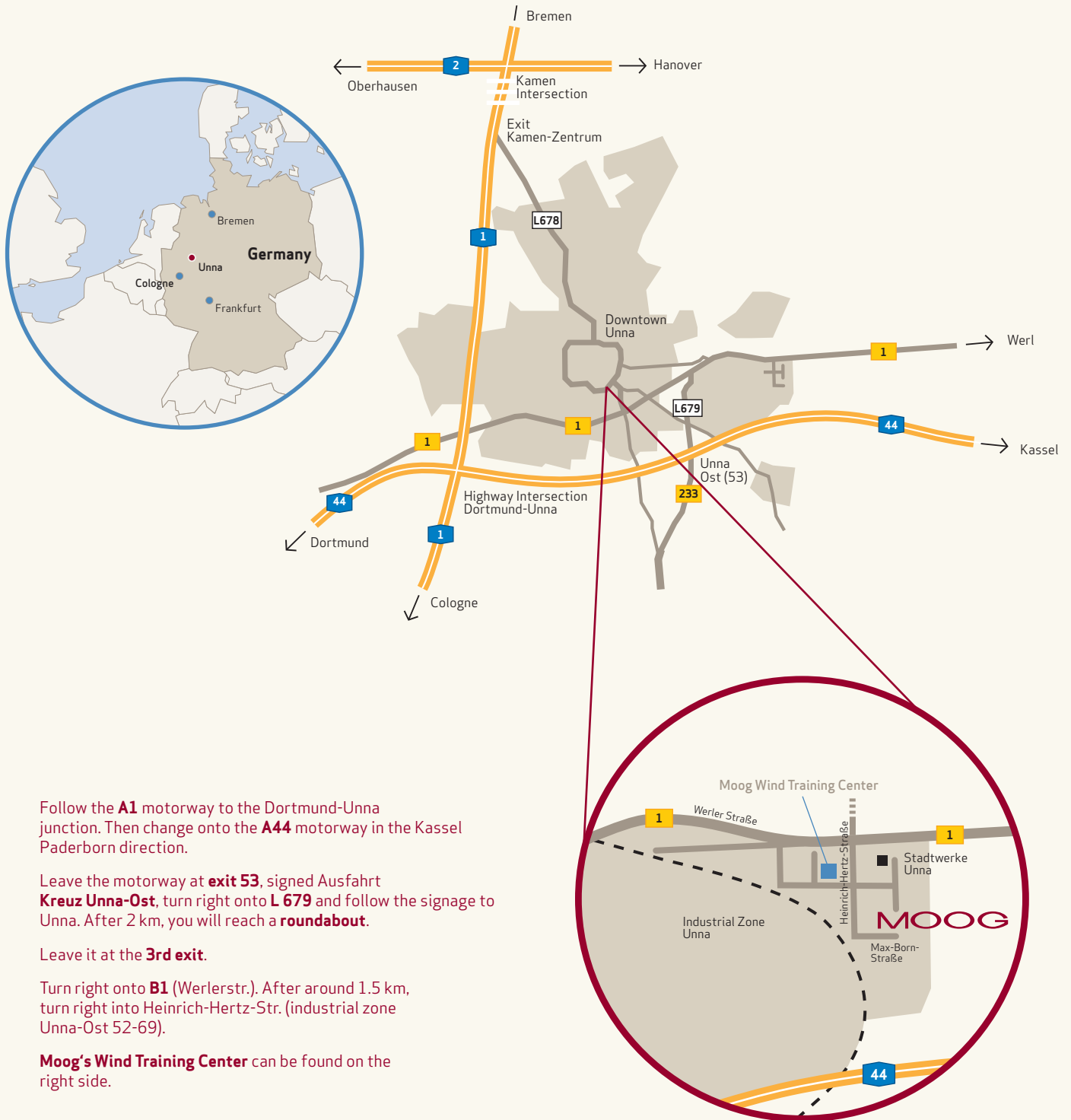
Registration must be submitted in writing by e-mail, fax or mail and requires confirmation.

In the event of a cancellation up to four weeks prior to the beginning of the training course, we will charge a cancellation fee of 50 % of the participation fee. Cancellations up to five days prior to the beginning of the training course will be charged at 75 % of the participation fee. For no-shows, the full fee will be billed.

Another person can attend the training course instead of the person registered. There is no additional charge for this substitution.

Terms are subject to change and modification.

DIRECTIONS



Follow the **A1** motorway to the Dortmund-Unna junction. Then change onto the **A44** motorway in the Kassel Paderborn direction.

Leave the motorway at **exit 53**, signed Ausfahrt **Kreuz Unna-Ost**, turn right onto **L 679** and follow the signage to Unna. After 2 km, you will reach a **roundabout**.

Leave it at the **3rd exit**.

Turn right onto **B1** (Werlerstr.). After around 1.5 km, turn right into Heinrich-Hertz-Str. (industrial zone Unna-Ost 52-69).

Moog's Wind Training Center can be found on the right side.

Heinrich-Hertz-Str.1
59423 Unna, Germany

If you wish to contact us by mail,
please use our mailing address:

Moog Unna GmbH
Max-Born-Str. 1
59423 Unna, Germany

Telephone: +49 2303 5937 0
Web: www.moog.com/wind

MOOG PITCH TRAINING IS JUST ONE WAY WE STRIVE TO KEEP YOU PRODUCTIVE

Moog offers a variety of ways to assure the maximum availability, greatest reliability and safety of your wind turbine. Moog Pitch Control Training is just the beginning.

Moog Global Support™ is your direct link to optimal turbine reliability and performance, enhancing the training courses offered at the Moog Wind Training Center with key service and parts offerings. Here are a few of the ways our service and spare parts complement our training programs to keep you working reliably and effectively.

Service

Moog has a presence in 25 countries worldwide, so our technicians understand what you're up against and speak your language, too.

- 24/7 helpline
- On-site service brings the expertise to you
- Planned preventative maintenance programs decrease downtime
- Total support for setting up or commissioning new installations
- Diagnostics and fault-finding
- System optimization
- Preparation of customer-specific documentation

Parts

Reduce downtime with a spare parts program designed specifically around your wind turbines.

- Upgrade with the latest technologies
- Get high-quality spare parts virtually anywhere in the world
- On-site exchanges, conversions and repairs

Training

Gain a productivity advantage with the variety of Moog Pitch Control Training courses found in this catalog. All courses are part of our commitment to Moog Global Support™.

We invite you to learn more about Moog Global Support™ at www.moog.com/wind.



TAKE A CLOSER LOOK.

Moog solutions are only a click away. Visit our worldwide website for more information and the Moog facility nearest you.

Argentina
+54 11 4326 5916
wind.argentina@moog.com

Australia
+61 3 9561 6044
wind.australia@moog.com

Brazil
+55 11 3572 0400
wind.brazil@moog.com

Canada
+1 716 652 2000
wind.canada@moog.com

China
+86 21 2893 1600
wind.china@moog.com

Finland
+358 10 422 1840
wind.finland@moog.com

France
+33 1 4560 7000
wind.france@moog.com

Germany
+49 2303 5937 0
wind.germany@moog.com

Hong Kong
+852 2 635 3200
wind.hongkong@moog.com

India
+91 80 4057 6605
wind.india@moog.com

Ireland
+353 21 451 9000
wind.ireland@moog.com

Italy
+39 0332 421111
wind.italy@moog.com

Japan
+81 463 55 3767
wind.japan@moog.com

Korea
+82 31 764 6711
wind.korea@moog.com

Luxembourg
+352 40 46 401
wind.luxembourg@moog.com

Netherlands
+31 252 462 000
wind.netherlands@moog.com

Norway
+47 64 94 19 48
wind.norway@moog.com

Russia
+7 83171 31811
wind.russia@moog.com

Singapore
+65 6773 6238
wind.singapore@moog.com

South Africa
+27 12 653 6768
wind.southafrica@moog.com

Spain
+34 902 133 240
wind.spain@moog.com

Sweden
+46 31 680 060
wind.sweden@moog.com

Switzerland
+41 71 394 5010
wind.switzerland@moog.com

United Kingdom
+44 1684 296600
wind.uk@moog.com

USA
+1 716 652 2000
wind.usa@moog.com

www.moog.com/wind

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