

PIL

Discover Pilz Trainings



Basis of CE Marking





PSS 4000 - PNOZmulti - Safety Requirements Programming and Service Programming and Service and Integration of AGVs

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International Training Calendar

Enhanced success through professional development

- > Training courses for machinery safety and automation
- International qualification programme
- Online training live wherever you are







Experience our International Training Calendar portfolio live wherever you are!

International Training Calendar

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International Qualification Programme

A programme that adapts for you! In an era of ever changing safety technologies, best engineering practice, safety legislation and international standards, safety in the workplace has now become a priority among employers and employees alike, across all aspects and all levels of business.



Professional competence development offers both the individual and whole organisation many benefits. It empowers individuals to make advances in their career, increasing their personal competence within the workplace. It provides organisations with a competitive edge within their industry sector by directly improving productivity through heightened awareness and implementation of quality standards and safety practices. Our qualification programme works by facilitating employees at all levels to enter at the stage most suitable for them and continue through to the final level (Expert) if relevant to their role.



The competence development path comprises of 4 levels: Introduction, Fundamental, Advanced and Expert. As the levels progress, the content will increase in complexity to suit the advancing level of competence. We can assist you at to design a suitable path for your corporate requirements and the individual needs of your employees.

International

Our global training portfolio is available in all countries where there is a Pilz subsidiary and we can offer them in non Pilz countries upon request. We partner with multinational customers to implement corporate programmes, which can be rolled out internationally in order to achieve a consistent standard for your company across the globe.

Training courses for machine operators and machine manufacturers

There is a suitable training course for every safety professional whether involved in the design, construction, operation, maintenance or safety of machinery. There is only one approach for machinery safety irrespective of industry – achieving total safety and reducing risk to the lowest level possible.

Made for you!



Jaime Alonso Vallin, Senior Manager, International Services Group, explains what makes our qualification programme so special:

Pilz training has been carefully developed with decades of experience, working in partnership with the leading manufacturing companies in the world. The competence development approach came about as a direct result of customer needs to allow their employees to follow a clear path in machinery safety, which would ultimately result in a formal qualification. Our modular approach means a tailor made programme can be designed to suit each individual within your organisation.

We have worked with corporate customers to ensure our training portfolio aligns with their needs and allows their employees move at a pace suitable to their individual professional circumstances.

All of our training is delivered by experienced safety consultants that are knowledgeable in safety related standards, regulations and technology. They have the ability to address detailed technical queries on how best to apply the training to specific cases within your business. Our local safety consultants are continuously engaged in delivering safety consulting, engineering and automation services to our customers and reflect that experience and knowledge while delivering training courses.

International Qualification Programme







Level: Introduction

You can attend the training courses on this level without special prior knowledge in the respective subject area. You receive an introduction to the topic, then you have a good overview and you can subsequently specialise further and participate in training courses of the following levels. On the Introduction level we also offer e-learning for self-study.

Level: Fundamental

On this level we provide all the relevant fundamentals to achieve a good technical understanding. This is not just the pure basics; we also offer less complex topics on this level. The Fundamental training courses cover over and above the basics in self-contained subjects and they serve as a basis for further qualification on the Advanced level.

Level: Advanced

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If you already have good knowledge and experience in a subject area, our offer on an Advanced level is exactly what you need. To reach the minimum qualification level to attend training courses on this level, you can also attend courses from the Introduction or Fundamental level in advance. Here you can deepen your knowledge and expand your professional skills in key areas.

Level: Expert

We recommend this highest qualification stage for taking the step to becoming an absolute expert in a subject area. With the relevant professional experience or participation in training courses of the three previous levels, you will find comprehensive specialist knowledge at an expert level here. Additionally, all the qualifications are always confirmed and certified by an acknowledged test organisation. An additional benefit for you: Following successful participation, you will receive an internationally recognised title that confirms your qualification and that you can use in your e-mail signature or on your business cards.

Our International Network – Qualification all aro



An increasingly digitised and networked world poses new challenges for automation and for those who are involved with it. International standards are just as important to us as national regulations. We support you anywhere in the world with an extensive offer of training courses on an internationally uniform level. Our approximately 2 500 employees at 42 subsidiaries and branches on all 5 continents make sure of this.



CMSE – Certified Machinery Safety Experts

> Allow our experts at subsidiaries around the world to train you further. Benefit from our expertise in the application of optimum manufacturing processes to optimise the availability and productivity of your plants all over the world.

Your benefits at a glance

- You are trained by international trainers with many years of practical experience in the area of machinery safety.
- Our well networked global team ensures that you are always up to date with regard to national and regional requirements from standards and laws.

Very experienced speakers.



und the World





Digital Learning



Live online training

During our live online training sessions, you are guided through the training live and virtually by our trainers.

We also ensure interaction within our online training courses using open discussions and rounds of questions.

Another component is the integrated exercises that are interactively performed during the training. You have direct contact with the trainer and other participants and learn intensively and focused in your local environment. The live online training courses offer you opportunities for discussion with trainers and people from other companies or your own company. All this without travel time and the option of being integrated into day-to-day work as half-day blocks without compromising learning success.

You learn in real time with maximum flexibility, either from home or the office. Live online training enables skilled staff and managers to partake in regular training at lower cost and with a shorter time requirement.

Your benefits at a glance

- You see the trainer live, just like in face-to-face instruction
- Open discussions about your own questions
- Digital training documents are made available to you in advance
- For our TÜV NORD trainings offered in online format, the accompanying multiple choice examination is also offered online
- Our live online training supports that multiple colleagues from your company located in different countries can receive the same training at the same time
- Experience our online training portfolio live wherever you are
- Eliminating the need for travel



Guide to the Machinery Regulation 2023/1230





Introduction to Machinery Regulation

- Check the changes that affect you. The Guide to the Machinery Regulation will help you with this. Everything in one document!
- Benefit from our special training and gain basic understanding of the Machinery Regulation and the 6-step process to achieve the CE marking



International Online Training Calendar

Live training wherever you are in three time zones all over the world

Want to avail of our premier trainings online from wherever you are located in the world? We have selected a number of our most popular trainings from our international training portfolio and have scheduled these as part of a publicly available international training calendar. These trainings, offered online in English language, are delivered by a live trainer and can be joined from wherever you are in the world. These trainings may be suitable if:

- > You are looking for training in the English language, but are based in a country where English isn't the first language used
- If you have a small number of colleagues or employees located in several countries that may be seeking to attend a training, but you do not have the number of participants to having a private training onsite or online
- ▶ If you cannot travel to a public classroom training
- If Pilz are not located in your country

Experience our international training portfolio

Take the first step today in furthering your machine safety knowledge and contact Pilz to secure your place in one or more of our upcoming trainings. If you have a group of 8 or more, consider contacting us about a private online training just for your employees.

Europe

Training Name	Level	Duration	Date	Start time
Introduction to Machinery Regulation	Introduction	1 session; 3 hours	 14/03/2024 27/06/2024 12/09/2024 	 09.00 CET 09.00 CET 09.00 CET
Fundamentals of Machinery Safety	Fundamental	4 sessions; 16 hours	04-07/03/202409-12/09/2024	09.00 CET09.00 CET
Risk Assessment Workshop	Fundamental	2 sessions; 8 hours	▶ 01-02/10/2024	▶ 09.00 CET
Design of Safety Control Systems according to ISO 13849 and IEC 62061	Advanced	2 sessions; 8 hours	▶ 25-26/09/2024	▶ 09.00 CET
Basis of CE Marking	Advanced	2 sessions; 8 hours	11-12/03/202418-19/09/2024	▶ 09.00 CET▶ 09.00 CET
Robot Safety and Integration	Advanced	2 sessions; 8 hours	▶ 03-04/09/2024	▶ 09.00 CET
Safety Requirements and Integration of AGVs	Advanced	2 sessions; 8 hours	▶ 12-13/11/2024	▶ 09.00 CET
Robot Operating System Application for Autonomous Mobile Vehicles	Advanced	4 sessions; 16 hours	12-15/03/202421-24/10/2024	09.00 CET09.00 CET
CMSE® – Certified Machinery Safety Expert	Expert	7 sessions + exam; 29 hours	15-25/04/202418-28/11/2024	▶ 09.00 CET▶ 09.00 CET
CEFS – Certified Expert in Functional Safety	Expert	4 sessions - exam; 17 hours	13-17/05/202404-08/11/2024	▶ 09.00 CET▶ 09.00 CET
CECE – Certified Expert in CE marking	Expert	4 sessions - exam; 16 hours	▶ 14-18/10/2024	▶ 09.00 CET

America

Training Name	Level	Duration	Date	Start time
Fundamentals of Machinery Safety	Fundamental	4 sessions; 16 hours	19-22/03/202429/10-01/11/2024	11:00 EST11:00 EST
Risk Assessment Workshop	Fundamental	2 sessions; 8 hours	07-08/02/202407-08/08/2024	11:00 EST11:00 EST
Design of Safety Control Systems according to ISO 13849 and IEC 62061	Advanced	2 sessions; 8 hours	22-23/02/202401-02/10/2024	11:00 EST11:00 EST
Basis of CE Marking	Advanced	2 sessions; 8 hours	▶ 16-17/04/2024	▶ 11:00 EST
Robot Safety and Integration	Advanced	2 sessions; 8 hours	▶ 18-19/04/2024	▶ 11:00 EST
Safety requirements and integration of AGV's	Advanced	2 sessions; 8 hours	▶ 03-04/10/2024	▶ 11:00 EST
CMSE® – Certified Machinery Safety Expert	Expert	7 sessions + exam; 29 hours	 27/02-08/03/2024 11-21/06/2024 08-18/07/2024 05-15/11/2024 10-20/12/2024 	 11:00 EST 11:00 EST 11:00 EST 11:00 EST 11:00 EST 11:00 EST
CECE – Certified Expert in CE Marking	Expert	4 sessions + exam; 17 hours	> 22-26/04/2024	▶ 11:00 EST
CEFS - Certified Expert in Functional Safety	Expert	4 sessions + exam; 17 hours	 26/02-01/03/2024 07-11/10/2024 	 11:00 EST 11:00 EST

Asia				
Training Name	Level	Duration	Date	Start time
Design of Safety Control Systems according to ISO 13849 and IEC 62061	Advanced	2 sessions; 8 hours	 14-15/02/2024 08-09/05/2024 21-22/08/2024 	 12.30 AEST 12.30 AEST 12.30 AEST
Basis of CE Marking	Advanced	2 sessions; 8 hours	▶ 22-23/05/2024	▶ 12.30 AEST
Robot Safety and Integration	Advanced	2 sessions; 8 hours	▶ 30-31/10/2024	▶ 12.30 AEDT
CMSE® – Certified Machinery Safety Expert	Expert	7 sessions + exam; 29 hours	11-21/06/202402-12/12/2024	12.30 AEST12.30 AEST
CEFS - Certified Expert in Functional Safety	Expert	4 sessions + exam; 17 hours	▶ 06-14/11/2024	▶ 12.30 AEDT

Training Portfolio



Our complete international training portfolio at a glance



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CEFS – Certified Expert in Functional Safety ¹⁾	36
CMSE® – Recertification	-
CECE® – Recertification	-
CESA – Certified Expert for Security in Automation	-

Progress through the stages to Expert Level

ming and Service

¹⁾ Offered as part of International online training calendar – see page 12-13 for duration and dates

Introduction to Machinery Regulation



Objective

The aim of this training is to provide a basic understanding of the Machinery Regulation and the fundamental 6-step process to achieve the CE marking. This training will state the main changes in the Regulation in relation to the Machinery Directive, the motivation to change from a directive to a regulation and an overview of the 6-step process. The knowledge acquired during the Introduction to Machinery Regulation Training together with the exercises will allow attendees to be informed about the new regulation.

Contents

- What's New in Machinery Regulation
- Transitional Period
- Important changes
- Introduction to Machinery Regulation
 - Roles
 - Definitions
- Machinery Regulation in the context of the 6-Step CE Mark process
- Essential Health and Safety Requirements
- Relevant exercises

Target groups

This training is particularly oriented towards machine manufacturers, importers, integrators, distributors and end users that need to be updated with the Machinery Regulation:

- Machine Designers
- Commissioning engineers
- Design engineers
- Project and Engineering managers
- System integrators
- ▶ EHS Managers
- ▶ Those responsible for upgrades machinery
- Maintenance of plant
- > End users responsible for procurement of machinery



Note

The training is provided in both classroom and online format with a live instructor. Participants are required to attend on specific dates and times. For online training, a laptop equipped with a webcam, and Google Chrome or Microsoft Edge is required to participate. This training provides an ideal introduction to the Machinery Regulation and an overview of main changes in relation to the Machine Directive. If you have already completed training in CE Marking, this training will provide an update on the upcoming Machinery Regulation. For those who wish to pursue further training in the area of CE Marking, the training can provide an advantage in understanding the 'Basis of CE Marking' training which is a pre-requisite for 'CECE – Certified Expert in CE Marking' certification.

Benefits to you

- + Gain an overview of the Machinery Regulation
- Understand the role and responsibilities of manufacturers, importers, designers, end users, etc of machinery with regards to the Machinery Regulation
- Become familiar with how to apply the Machinery Regulation to the CE marking process
- Understand main Essential Health and Safety Requirements

Your optimum qualification path:



Fundamentals of Machinery Safety



Objective

The aim of the training is for participants to gain a deeper knowledge of technical safety in industry, improving competence in the key areas particularly relevant for machinery safety. The focus is on the topics CE marking, risk assessment, safeguarding methods and systems, safety components and introduction to safety control systems and the ISO 13849 and IEC 62061 standards. The general requirements of electrical safety of machines are outlined, along with control of hazardous energy by using LOTO (Lock Out Tag Out) and introduction to Robot Safety. The influence of standards and legislation that drive machine safety are explained in greater detail allowing a wider stronger understanding of these areas for participants.

Contents

- Review of introduction level
- International legislation
- Local legislation
- Safety standards
- ▶ CE marking
 - Introduction to CE marking
 - Machinery Regulation
 - Validation of EHSR
 - (Essential Health and Safety Requirements)
 - Requirements from other directives
- Risk Assessment
 - Introduction to risk assessment
 - Standards and Regulations
 - Methods and systems
 - Introduction to risk reduction measures
- Introduction to safeguarding methods and systems
 - Standards related to mechanical guardingGuarding devices
- Electrical safety (EN/IEC 60204/NFPA 79)
 - General requirements for the electrical safety of machinery
- Lockout tagout control of hazardous energy
 - LOTO Process Overview
 - LOTO Procedure and tools
- Introduction to safety control systems
 - Introduction to Functional Safety
 - ISO 13849
 - Introduction and Scope
- Robot safety
 - Applicable standards and legislation
 - Assessments and safeguarding



Target groups

The target group for this training are those who already have a good understanding of the basic requirements of machine safety legislation or have completed the introduction level training. Personnel suitable for this training are:

- Manufacturing Engineers
- Maintenance Engineers
- Automation and Design Engineers
- Electrical Engineers
- Mechanical Engineers
- ▶ Line managers
- Maintenance Technicians
- Health & Safety personnel.
- Project managers
- ▶ Planners

Note

The training is provided in both classroom and online format with a live instructor requiring participant to attend at specific times. For online training, a laptop is required to participate which is equipped with a webcam, and Google Chrome or Microsoft Edge.

Benefits to you

- + Know the compliance steps of CE Marking for putting new or existing machines into service in the EU
- Understand the requirements and application of various safeguarding types when upgrading or designing machines
- + Understand the general electrical requirements to consider when ensuring machinery safety
- Learn the process requirements when specifying, designing. implementing and validating machinery control systems

Your optimum qualification path:



Risk Assessment Workshop



Objective

The workshop equips the participants with the knowledge and skills to carry out risk assessment of machinery – both new and existing – in accordance with ISO 12100. Risk assessment is a required and a fundamental aspect of machinery safety, as well as the first step towards complying with legal regulations and standards. This workshop uses images and videos to guide you through the risk assessment process on machinery in an interactive and practical way. Participants learn how to identify hazards and perform risk evaluations. This course also covers how to apply appropriate risk reduction measures and determine the residual risk.

Contents

- ▶ Risk analysis process theory
 - Risk assessment legislation and standards
 - Competence in risk assessment
 - Risk assessment process according to ISO 12100
 - Risk estimation tools risk matrix, risk graph and HRN
- Practical Risk analysis process
 - Identifying the limits of the machine
 - Identifying the hazards present
- Risk estimation and risk evaluation
- Risk assessment process workshop findings
- Risk reduction measures theory
 - Hierarchy of control
 - Inherently safe design
 - Safeguarding controls
 - Safeguarding
 - Common standards
 - Safety control systems
- Practical Risk reduction measures
 - Identification of potential risk reduction measures
 - Re-estimating the risk based on risk reduction measures



Target groups

The training has been developed to respond to a requirement among technical personnel responsible for a more practical approach to ensuring risk identification and risk reduction in machinery and for ensuring overall, including:

- Standards officers
- Design engineering managers
- Plant construction and control system design engineers
- Technical engineering managers
- Safety officers and specialists involved in workplace evaluation
- Personnel responsible for acquiring machinery or putting it into service, including purchasing personnel, project engineers and production managers
- Those responsible for upgrades and maintenance of plant and machinery
- Managing directors of machine engineering companies and control systems manufacturers

Note

The training is provided in both classroom and online format with a live instructor requiring participants to attend at specific times. For online training, a laptop is required to participate which is equipped with a webcam, and Google Chrome or Microsoft Edge.

Benefits to you

- Comprehensive understanding of how to approach the risk assessment process using the relevant standards and knowing the required steps for performing a risk assessment on a machine
- Knowledge to evaluate the risk associated with specific hazards, to determine the required risk reduction and to identify residual risk
- Maximum practical orientation using interactive, actual case studies

Your optimum qualification path:



Fundamental: Risk Assessment Workshop

Advanced: Basis of CE Marking

Expert: CECE - Certified Expert in CE Marking

Design of Safety Control Systems according to ISO 13849 and IEC 62061



Objective

The objective of the training is to provide a clear understanding of the main principles of the standard ISO 13849-1 and IEC 62061. This training course addresses how ISO 13849-1 and IEC 62061 (the safety-related control systems standards) are applied in automation and equipment design to determine the required Performance Level for safety functions.

Contents

- Basics of functional safety and principles of ISO 13849-1
- Safety functions
 - Subfunctions
- Required performance level
- Subsystem design
 - Subsystem decomposition
 - Performance Level of the subsystem
 - MTTF_{D}
 - Categories
 - Diagnostic Coverage
 - Common Cause Failure
 - Safety Related Software
 - Systematic failures
- PL of the safety function
 - Performance Level of the safety function
 - Incorporation of subsystems
 - Addition of PFH_D
 - Calculation examples
- Validation and documentation
 - Basic principles of IEC 62061
 - Required SIL according to IEC 62061
 - Subsystem design
 - SIL of the safety function
- Software tools



Target groups

Developers, design engineers and planners in plant and machine engineering and control and automation technology

Note

The training is provided in both classroom and online format with a live instructor requiring participants to attend at specific times. For online training, a laptop is required to participate which is equipped with a webcam, and Google Chrome or Microsoft Edge.

Benefits to you

- Detailed calculation of the required performance level and evaluation of the achieved performance level in safety function design
- Main architectures and alternatives in the design of safety-related control systems, including practical examples
- + Advantages of a structured concept for the design of safety systems
- Tried-and-tested methods for your machine design

Your optimum qualification path:



Fundamental: Fundamentals of Machinery Safety

Advanced: Design of Safety Control Systems according to

ISO 13849 and IEC 62061

Expert: CEFS – Certified Expert in Functional Safety

Basis of CE Marking



Objective

The Basis of CE marking is designed to provide the fundamental steps and technical understanding of the considerations to be taken when CE Marking machinery following the 6-step process for CE Marking. The training can provide the foundation to becoming a Certified Expert in CE Marking. The knowledge acquired during the Basis of CE Marking training will allow attendees to understand the process in detail and can be built upon progressively through onsite experience and further training.

Together with the experiences from the practical exercises on a 3D machine model, after the training you will be able to accurately assess the status of your machines and ensure their conformity.

Contents

- European Directives and Regulations
 - Introduction to European directives and regulations
 - CE mark purpose and requirements
 - CE marking directives and regulations
 - Product versus workplace directives
- CE marking process
 - 6-step process for CE marking machinery
 - European legislation for plant and machinery
- Legal framework
 - Machines according to
 - Machinery Regulation 2023/1230 - Other directives
- ▶ Define requirements
 - Essential requirements (ESR) from legislation
 - Risk assessment in accordance with EN ISO 12100
 - A, B and C type standards
- Conformity procedure
 - Selection of correct conformity procedure
 - Involvement of notified bodies
- Conformity Validation
 - Use of standards in the validation phase
- ▶ Technical file & CE mark
 - Contents and compilation of the TF
 - Affixing the CE mark
- Enforcement
 - Legal cases





Target groups

This training is particularly oriented towards machine manufacturers, machine importers machine integrators and machine end users with special responsibility in the area of CE marking. Such as:

- Machine Designers
- Commissioning engineers/ managers
- Design engineers
- Project and Engineering managers
- Machine Planners
- System integrators
- ▶ EHS Managers
- Production managers and officers
- Those responsible for upgrades and maintenance of plant and machinery
- ▶ End users responsible for procurement of machinery

Note

The training is provided in both classroom and online format with a live instructor requiring participants to attend at specific times. For online training, a laptop is required to participate which is equipped with a webcam, and Google Chrome or Microsoft Edge.

This training is the ideal preparation for qualification as CECE – Certified Expert in CE Marking. Both courses can generally be completed in direct succession.

Benefits to you

- Gain an overview of European directives and Regulations that relate to machinery, including the legislative framework within the EU, identifying the directives and regulations applicable to CE Marking and an introduction to the main workplace and product directives
- Understand the role of manufacturers, importers, designers, end users, etc of machinery with regards to CE Marking
- Learn the fundamental aspects of the CE marking process for machinery in line with the 6-step method – from determination of applicable legislation to affixing the CE Mark
- Understand the different types of standards
 (A, B and C type) and the how harmonised standards
 can be used in the CE marking process
- Practical relevance through practice and application on a specimen machine

Your optimum qualification path:



Introduction: E-learning: Machinery Safety – Introduction and Best Practice Fundamental: Risk Assessment Workshop or Fundamentals of Machinery Safety

Advanced: Basis of CE Marking

Expert: CECE - Certified Expert in CE Marking

Robot Safety and Integration



Objective

As they are both affordable and easily teachable, robots are increasingly being integrated with machinery and automated production lines. They are used to achieve repeatability with high productivity. Robots are also used to perform hazardous tasks in many different fields such as material handling, assembly, welding, machine tool loading and unloading, painting, spraying, and so forth. Safety is critical in the integration of robots in manufacturing operations. Studies indicate that many robot accidents occur during non-routine operating conditions, such as programming, maintenance, testing, setup or adjustment. During many of these operations the worker may temporarily be within the robot's working envelope where unintended operations could result in injuries. The aim of this training is to provide those who integrate robot applications with knowledge of the essential requirements of robot and collaborative application safety. This includes a review of the scope of the international standards ISO 10218-1 & 2 in relation to robots and robot integration. The training course covers, amongst other things, robot classification, cyber security, risk assessment and risk reduction requirements, safety function performance level and validation/verification requirements for robot applications.

We show you the measures for designing risk reduction and the use of integrated control strategies. In addition, it is explained how high availability and productivity can be achieved while taking safety requirements into account.

Contents

- Robot safety
- Robot class, robot space, zones and cybersecurity
- Applicable legislation and standards relevant to
- robot safety
- ANSI standards
- ISO standards 10218-1 and 2
- Correlations between the standards
- Assessment of risk in robot systems including
 - Robot and robot system specific hazards
 - Design risk reduction requirements
- Robot safety solutions
- Protective measures
- Control functions and cyber security
- End effectors
- Load/unload stations
- Energy isolation in robot applications
- Teaching
- Collaborative applications
 - Collaborative methods
 - Risk reduction for collaborative applications
- Verification and validation requirements
- A worked example of safe robot integration







Target groups

The training is aimed in particular at personnel responsible for ensuring robot system compliance and safety including:

- Technical personnel who are responsible for maintaining the conformity of robot systems, including machine designers
- Robot system integrators
- Project engineers
- Plant engineering and maintenance engineers
- Health and safety engineers

Note

The training is provided in both classroom and online format with a live instructor requiring participants to attend at specific times. For online training, a laptop is required to participate which is equipped with a webcam, and Google Chrome or Microsoft Edge.

Benefits to you

- Knowledge of the relevant standards and best engineering practise relating to integration of safety in robot applications
- Detailed risk assessment process in relation to robot system integration
- Knowledge of design safety measures to reduce risk
- + Understanding requirements for validation and verification of the robot system

Your optimum qualification path:



Introduction: E-learning: Machinery Safety – Introduction and Best Practice

Fundamental: Risk Assessment Workshop

Advanced: Robot Safety and Integration

Expert: CMSE - Certified Machinery Safety Expert



Safety Requirements and Integration of AGVs



Objective

An automatic guided vehicle system (AGV system) consists of one or more computer-controlled, wheelbased load carriers (normally battery powered) that runs on the plant or warehouse floor (or if outdoors on a paved area) without the need for an onboard operator or driver.

The training offers a comprehensive insight into the correct operation of AGV trucks and systems at the workplace. You will receive all the information you need to know about the key requirements on the safety of AGV. As part of the course, you will also receive a detailed overview with regard to the functionality of AGV trucks and systems and AMR (Autonomous Mobile Robots) as well as of the risk that results when one or more AGV trucks or AMR are integrated into an existing system. The risks relating to this type of system differ from those of conventional machinery, primarily due to their mobile characteristics and the increased use of artificial intelligence (AI) systems. The training course will therefore also teach you the typical measures for risk reduction as well as the use of various safety strategies.



Contents

- Introduction to AGV and AGV system safety
- Applicable legislation and standards relevant to AGV system safety including the following:
 - ISO 12100 and ISO 13849-1
 - ISO 3691-4 and EN 1175
 - Correlations between the standards
- AGV system overview
- Classifications and definitions relating to AGV systems
- Significant hazards of AGV systems including associated requirements from the standards specific to AGV systems, including:
 - Intended use of the AGV system
 - Navigation control and collision prevention of the AGV system
 - AGV motion system
 - Safety-related parts of the control system
 - Electrical safety
- Other specific hazards for AGV systems
- Safety requirements for AGV for control of motion and load handling hazards
- Introduction to safety requirements to reduce AGV system hazards
 - Guarding and guard functions
- Control functions
- Laser scanners for AGV application
- Other devices for people/obstacle detection and how they work
- Verification requirements





- Risk reduction for AGV systems
 - AGV system zones
 - Operational zones
 - Operational hazard zone
 - Restricted zone
 - Personnel that require protection from AGV system hazards
 - Persons working in the vicinity of the AGV system
 - Personnel using vehicles in the vicinity
 - Maintenance staff
 - Integration and installation of the AGV system
 - Load transfer points
 - Associated machinery and equipment
 - Use and maintenance of the AGV system
- Worked examples of AGV system safety requirements

Target groups

This training is aimed in particular at AGV manufacturers, integrators and users with special responsibility when using AGV systems. The course is also specifically oriented toward persons who are responsible for machinery safety on new and existing AGVs in day-to-day operations, such as:

- Plant engineers
- ▶ Health and safety officers
- Project engineers
- Maintenance staff
- Technical engineering managers

Note

The training is provided in both classroom and online format with a live instructor. Participants are required to attend on specific dates and times. For online training, a laptop equipped with a webcam, and Google Chrome or Microsoft Edge is required to participate.

Benefits to you

- Learn how to correctly apply and implement relevant standards and directives and the proven technical methods for integrating AGVs in an industrial environment
- Manage the risk that arises through the installation and application of automated guided vehicles in an industrial environment
- Know which safety technologies can be used to ensure safe interaction between people and AGVs
- Assess and evaluate your existing plants regarding the safety of automated guided vehicle systems

Your optimum qualification path:



Introduction:Introduction to Machinery Safety

Fundamental: Risk Assessment Workshop

- Advanced: Safety Requirements and Integration of AGVs
- Expert: CMSE Certified Machinery Safety Expert



Robot Operating System Application for Autonomous Mobile Vehicles



Objective

The Robot Operating System (ROS) is an open-source software that enables the user to network various technologies from different robots, mobile platforms, grippers and much more. ROS also enables the planning of motion paths as well as creation and modelling of robot applications and user interfaces.

This training introduces you to the ROS platform with a learning-by-doing approach, combining theoretical explanations with a practical part that is demonstrated step-by-step through the training for modelling a robotic layout and its main elements.

In addition, we will show you how to start your own mobile vehicle project by modelling its main elements and using open-source packages to control the movements and simulation. ROS2 is also introduced and both versions are considered in the training scope.

Part of the training focuses on the introduction to the use of ROS and ROS2 for mobile robot control and autonomous navigation based on SLAM. Integration of related sensors with these technologies, like safety scanners, is addressed along with the complete application based on real hardware. At the end of the training, you will be able to create an autonomous mobile vehicle project with ROS and ROS2, capable of navigating autonomously, and you will know how to implement it in real applications.

Requirements

Training requires a basic level in Linux O.S. terminal mode. You should also be familiar with high-level programming languages such as Python.

Contents

- Fundamentals and introduction to Linux OS basics for running ROS
- ▶ ROS environment and programming
- Differences and comparison between ROS and ROS2 packages for mobile robot autonomous navigation
- Theoretical concepts related to the differential mobile vehicle navigation, such as kinematics, odometry, localisation or navigation algorithms
- Step-by-step integration of sensors for a mobile vehicle robot demo application
- Simulation of an autonomous mobile vehicle in a virtual environment



Target groups

This training is aimed in particular at manufacturers or integrators with special responsibility for autonomous mobile vehicle systems. In addition, the training is specifically designed for persons who are responsible for the practical integration of new and existing AMVs in their day-to-day business, such as:

- Technical personnel who are responsible for developing mobile vehicle controls
- Commissioning engineers
- AMV system integrators
- Project engineers
- Technical instructors and trainers

Note

The training is provided in both classroom and online format with a live instructor. Participants are required to attend on specific dates and times. For online training, a laptop equipped with a webcam, and Google Chrome or Microsoft Edge is required to participate.

Benefits to you

- Acquirement of strong ROS foundations, know-how and set-up within the ROS environment
- Guided introduction to ROS programming, with expert advice on how to solve barriers to get started quickly
- + Learning the basis of Python programming for ROS applications
- Get ready to exploit the various possibilities of a large development community

Your optimum qualification path:



Fundamental: Fundamentals of Machinery Safety

Advanced: Robot Operating System Application Vehicles

for Autonomous Mobile Vehicles

Expert: CEFS - Certified Expert in Functional Safety

CMSE[®] – Certified Machinery Safety Expert



Machinery requirements have changed significantly over the past number of years with the increasing use of automation and robotic systems, resulting in the need for intelligent machinery safety strategies. The changing requirements of legislation have also played their part in the use, maintenance, and operation of machinery. With machinery being designed, modified and upgraded to meet these requirements, it is necessary for companies to ensure that their relevant personnel have the knowledge required to make informed decisions on machinery safety. CMSE has been specifically developed to provide the market with an expert level training in the area of machinery safety and to enable those who complete the training to prove their competence through independent certification.

In partnership with:

TÜVNORD



Certified Machinery Safety Expert certification will provide you with the competence for the safeguarding of machines and plants. You will gain comprehensive knowledge and practical understanding of the machinery lifecycle, from risk assessment, to the creation of safety concepts, and application of functional safety principles, leading to the concrete implementation of compliance strategies. CMSE is a globally recognised qualification enabling a 360° to Machinery Safety.

In cooperation with TÜV NORD, Pilz offers the qualification to become a CMSE – Certified Machinery Safety Expert. The course gives a detailed view of the subject of machinery safety and is divided into five modules which convey comprehensive knowledge on and about the machinery lifecycle. The awarded TÜV NORD certificate is valid internationally.

Contents

Module 1:

- Fundamentals of Safety
- Introduction to safety legislation and Standards

Module 2:

- European Directives and Regulations History and Framework
- Equipment and Workplace Regulations
- CE Marking and the Machinery Regulation
- Occupational Health and Safety

Module 3:

- Risk Assessment
- Risk Assessment Workshop

Module 4:

- Mechanical Guarding
- Safety Components
- Electrical Safety

Module 5:

- Functional Safety of Control Systems
- Functional Safety of Pneumatic and Hydraulic Systems
- Functional Safety Workshop

Target groups

- Mechanical designers
- Control engineers
- System integrators
- Control system designers and machine builders
- Companies that operate plant and machinery
- Craftsmen, technicians, engineers

Pre-requisites for participation

To successfully participate in the expert training, you must verify that you have sufficient knowledge in the field of Machinery Safety. At least one of the following criteria must be fulfilled:

5+ years' experience in the area of Machinery Safety Long term professional experience and training in one or several areas relating to machinery safety e.g., technology, safety-related design and construction, safety-related maintenance and repair (5+ years).

Qualification and 1+ years' experience

- A Formal qualification(s) in the areas of General science, Engineering, Technology, Construction and Design, or Maintenance and Repair of Machinery from a University/Technical college where the training lasted two or more years AND
- At least one-year practical experience in one or several areas relating to machinery safety, e.g., technology, safety-related design and construction, safety-related maintenance and repair.

Are you unsure about whether your current qualification corresponds to the required level? Feel free to get in touch with us. We offer you individual consultancy and would be happy to show you possible alternatives with which you can achieve the qualification level for CMSE.

Notes

The training is provided in both classroom and online format with a live instructor. Participants are required to attend on specific dates and times. For online training, a laptop equipped with a webcam, and Google Chrome or Microsoft Edge is required to participate. An examination takes place at the end of the training. The examination can be in paper format (classroom based training only) or online format (classroom or online training). The exam is 60 minutes and 40 multiple choice questions are asked. A score of 80% or above must be achieved to pass the examination.

If the examination is passed, you receive the globally recognised TÜV NORD certificate of "CMSE – Certified Machinery Safety Expert". The certificate is valid for four years and then can be extended for another four years by taking part in a recertification.

Benefits to you

- Understand the requirements of the European regulations and standards in relation to machinery
- Discover how these may be applied to the design, build, maintenance and operation of machinery used within the European Economic Area
- Recognise and identify obligations that must be met when specifying, designing or putting a machine into service
- Enhance your competence in designing safety systems
- Be qualified as a CMSE[®] Certified Machinery Safety Expert (upon successful completion of the examination)

Your optimum qualification path:



Introduction: Introduction to Machinery Safety

Fundamental: Fundamentals of Machinery Safety

Advanced: Electrical Safety in Industrial Installations - IEC 60204

Expert: CMSE - Certified Machinery Safety Expert

CECE – Certified Expert in CE Marking



Objective

CECE - Certified Expert in CE Marking, is designed to enables attendees to obtain a deep technical understanding of the practical aspects of performing CE Marking for compliance with relevant legislation and standards. To achieve this, we guide participants through the CE process with a focus on the Machinery Regulation. The training takes the participant through CE Marking by following a 6-step process - from determination of the legal framework to affixing the CE Mark. A practical exercise for CE marking this machine is undertaken at each stage of the 6-step process using the same machine model from start to finish to ensure an understanding of the process on a 'real life' example. The course explains the requirements and the differences in the procedure for partly completed and completed machinery as well as beyond for an assembly of machinery.

In partnership with:

TÜVNORD

CECE in your organisation will guarantee a common and consistent level of understanding and competence concerning CE Marking process. After successful completion of the exam at the end of the training, each participant will be awarded an internationally recognised TÜV NORD certificate. CECE – Certified Expert in CE Marking is a title that can only be used by certified training attendees.

Contents

- European Safety Legislation
 - CE Marking Product Directives and Regulations
- Standards
- Roles and Responsibilities
- CE Marking 6 Step Process
- Other Considerations
- Legal Framework
- Machinery Regulation
- Other Directives
- Legal Framework Workshop
- Defining Requirements
 - Essential Requirements
 - Risk Assessment
 - Use of standards for Presumption of Conformity
 - Alternatives to Harmonised Standards
- Defining Requirements Workshop

- Conformity Assessment Procedure
- System of CAP Modules
- CAP Modules Variance
- Requirements for Notified Bodies
- Conformity Assessment Procedure for Machinery Regulation
- Annex IV Machinery
- Conformity Assessment Procedure Workshop
- Conformity Validation
- Requirements
- Planning
- Information
- Analysis
- Testing
- Documentation
- Conformity Validation Workshop
- Technical Documentation
 - Technical File
 - Complete Machinery
- Declaration of Conformity
- Partly Completed Machinery
- Technical Documentation Workshop
- Machinery Regulation Other Considerations
 - Assembly of Machinery
 - Substantial Modifications
- Authorised Representative
 - Minimum Tasks
- Conformity Assessment in more detail

Target groups

This qualification is aimed in particular at Machine manufacturers, machine importers and machine integrators with special responsibility for CE marking. Furthermore, it is designed for anyone who performs CE Marking on machinery, deals with the conformity of new, existing, or updated machinery or is responsible for procurement of machinery such as:

- Machine Designers
- Project and Engineering Managers
- Commissioning Managers
- Machine Planners
- System Integrators
- ▶ EHS Managers
- Production Managers
- > End users responsible for procurement of machinery
- Personnel responsible for modification and maintenance of plant and machinery

Pre-requisites for participation

To successfully participate in the expert training, you must verify that you have sufficient knowledge in the field of CE Marking. At least one of the following criteria must be fulfilled:

- Participation in the training course
 "Basis of CE Marking" or
- Participation in the training course
 "Complete CE Process in accordance with the Machinery Directive" within the last two years or
- You already have the qualification
 CMSE Certified Machinery Safety Expert or
- You already have the qualification
 ZMSE Certified Machinery Safety Expert (Germany)

As an alternative, comprehensive professional experience on the topic may also be sufficient for taking part in the qualification. Are you unsure about whether your current qualification corresponds to the required level? Feel free to get in touch with us. We offer you individual consultancy and would be happy to show you possible alternatives with which you can achieve the qualification level for the CECE.

Note

The training is provided in both classroom and online format with a live instructor. Participants are required to attend on specific dates and times. For online training, a laptop equipped with a webcam, and Google Chrome or Microsoft Edge is required to participate.

An examination takes place at the end of the training. Examination can be in paper format (classroom based training only) or online format (classroom or online training). The exam is 40 minutes duration and 25 multiple choice questions are asked. A score of 80% or above must be achieved to pass the examination.

If the examination is passed, you receive the globally recognised TÜV NORD certificate of "CECE – Certified Expert in CE Marking". The certificate is valid for four years and then can be extended for another four years by taking part in a recertification.

Benefits to you

- Comprehensive knowledge of the conformity assessment process which complies with the Machinery Regulation, up to application of the CE mark
- Benefit from our experts' experience. Following this qualification, you can directly implement the knowledge you have gained in practice – thanks to the detailed application examples and participation in the practical workshops
- Achieve the highest possible qualification in the area of CE marking in just two days

Your optimum qualification path:



Introduction: Introduction to Machinery Safety Fundamental: Fundamentals of Machinery Safety

Advanced: Basis of CE marking

Expert: CECE - Certified Expert in CE Marking

CEFS – Certified Expert in Functional Safety



In partnership with:

TUVNORD

Objective

Functional safety is the part of the overall safety of a system or piece of equipment that depends on automatic protection operating correctly in response to its inputs or failure in a predictable manner (fail-safe). The automatic protection system should be designed to properly handle likely human errors, systematic errors, hardware failures and operational/environmental stress.

Certified by TÜV NORD, the internationally recognised CEFS – Certified Expert in Functional Safety training course explores the standard and technical requirements to design, verify and implement a functional safety system. The training provides a thorough understanding of the applicable standards and a practical approach to designing complex safety systems. Participants are guided through the training, from the fundamental understanding of the standards required, through to safety requirements specifications and on to the design of a safety control system and validation.

In this expert training, you learn which standard and technical requirements exist for this type of system. From design and verification to implementation and validation, all central elements are examined.

CEFS includes a series of practical exercises to enable a thorough understanding of the process in ensuring the functional safety of equipment.



The qualification offers you comprehensive expertise on the corresponding standards as well as practical consideration of the creation of complex safety systems. After passing the examination, you are issued an independent certificate from TÜV NORD that verifies your qualification. Certified Expert in Functional Safety is an industry recognized qualification which ensures those with the qualification are in a position to lead in the area of functional Safety of machinery. Certified Expert in Functional Safety is a registered title that can only be used by certified training attendees.

Contents

- Basics of safety control systems
- ▶ Safety requirements specification
- Design of a safety system
- Workshop to define the maximum achievable performance level
- Validation
- Software tools
- Workshop drafting a validation protocol
- Special cases
- Class exercise
- Functional Safety Management

Target groups

CEFS is aimed at machine manufacturers, design engineers and integrators with special responsibility in the area of safe control systems. Furthermore, CEFS is specially intended for people who are responsible for machinery safety of new and existing machines in day-to-day operations, such as:

- Design engineers (electrical systems and fluid technology)
- ▶ Technical engineering managers
- Safety engineers
- Programmers of safe control systems
- Project engineers
- System integrators
- Test engineers who are responsible for the validation of machinery

Pre-requisites for participation

To successfully participate in the two-day expert training, you must verify that you have sufficient knowledge in the field of functional safety. At least one of the following criteria must be fulfilled:

- Prior knowledge on the topic of functional safety or
- Participation in a one-day Pilz training or in a different suitable training course on the topic of functional safety, e.g. "Design of Safety Control Systems according to ISO 13849 and IEC 62061" or
- You already have the qualification CMSE Certified Machinery Safety Expert.

Are you unsure about whether your current qualification corresponds to the required level? Feel free to get in touch with us. We offer you individual consultation and would be happy to show you possible alternatives with which you can achieve the qualification level for CEFS.

Note

A laptop equipped with a webcam and Google Chrome or Microsoft Edge is required to participate in the training – both for classroom and online. CEFS includes an online exam which takes place on a fixed day after the end of the training to allow you to participate comfortably at your workplace or from home.

The exam is 40 minutes duration and 25 multiple choice questions are asked. A score of 80% or above must be achieved to pass the examination. If the examination is passed, you receive the globally recognised TÜV NORD certificate of "CEFS – Certified Expert in Functional Safety". The certificate is valid for four years and then can be extended for another four years by taking part in a recertification.

Benefits to you

- Design and manage functional safety systems that are in accordance with ISO 13849-1 and IEC 62061
- Learn how to successfully validate systems for functional safety in compliance with current standards
- Understand all details about the effects of engineering decisions on the reliability and availability of the control system
- Learn how to select the most effective and cost-efficient control system that is ideally suited to your requirements
- A virtual machine model is used during the training as part of the workshop. This guarantees practical learning

Your optimum qualification path:



 Introduction: Introduction to Machinery Safety
 Fundamental: Fundamentals of Machinery Safety
 Advanced: Design of Safety Control Systems according to ISO 13849 and IEC 62061
 Expert: CEFS – Certified Expert in Functional Safety



Wir automatisieren.

The Customer Experience



The Customer Experience

Our training portfolio has been designed to cover all aspects of machinery safety. However, in order to give our customers a complete and immersive experience, Pilz utilises the latest learning systems technology available to provide an enhanced learning experience through interactive training platforms.



E-learning

We provide e-learning modules at our Introduction level. The e-learning modules serve as a solid foundation for topics that are then explored in more detail in other more advanced levels. The participant determines their own learning speed as they can take as many modules as they wish at any one time and resume their place in the training at a later time. All modules are accompanied by exercises throughout the training which can be completed online or in manual printed form. E-learning is currently available for the Safety Technology and Machinery Safety topics.



Interactive machine models

In order to 'design in' machinery safety hazards, Pilz have a number of machine models which have been specifically created for training in order to guide training participants through the process for achieving compliance or safety depending on the training topic.

Examination portal

The Pilz examination portal can be offered as part of a corporate training program offering. The Pilz examination portal is a global online system for assessing the knowledge of those who have completed a training programme. It allows assessment of the competence of personnel throughout the organisation globally and helps identify any individuals in specific regions or plants that require additional support.

The portal will be customised to your organisation in which tailor made examinations in the topics chosen by you are made available for an agreed period to your global target audience.

The application will present attendees with a range of multiple choice questions randomly generated from a Pilz database of questions created from the topics covered in the training material.



Corporate customised training programmes

Pilz specialises in training staff of global multinationals to meet the specific requirements of their organisations. We do this through customised corporate training programmes. These programmes are designed to enable employees to achieve a high level of competence in an efficient manner. They assist in reducing cost overruns caused by poor performance or miscommunication of job expectations. The programmes establish a framework for constructive feedback by management at scheduled training and performance appraisal intervals. They allow the creation of employee development and promotional paths within the organization.

The programmes are usually divided into three distinct phases:

- 1. Creation phase (material selection, choose specific content, display training levels, etc.)
- > 2. Pilot phase (delivery of pilot training in a number of agreed locations)
- 3. Delivery phase (feedback from pilot phase, creation of training/exam platform and international rollout)



Services: Consulting, engineering and training

As a solution supplier, Pilz can help you in the global application of optimum safety strategies that comply with specifications. Our services ensure the highest safety for man and machine worldwide.



Training

on Services

Online information at www.pilz.com



Training

Pilz supports you with a comprehensive range of training courses on all topics of machinery safety and automation.



Machinery safety

Risk Assessment

We review your machinery in accordance with the applicable standards and directives and assess the existing hazards.

Safety Concept

We develop detailed technical solutions for the safety of your plant and machinery through mechanical, electronic and organisational measures.

Safety Design

The aim of the safety design is to reduce or eliminate danger points through detailed planning of the necessary protective measures.

System Implementation

The results of the risk analysis and safety design are implemented to suit the particular requirements through selected safety measures.

Safety Validation

In the validation, the risk assessment and safety concept are mirrored and inspected by competent, specialist staff.

And we perform collision measurement for human-robot applications in accordance with the limit values from ISO/TS 15066.



International Compliance and Acceptance

CE Marking

We control all activities and processes for the necessary conformity assessment procedure, including the technical documentation that is required.

USA

With us you'll receive all the necessary documents that are required to have your machine certified through local authorities to achieve US compliance.

NR-12

As a complete supplier we can provide support from risk assessment to validation, technical documentation at the manufacturer's and final acceptance at the operator's in Brazil.

UKCA Marking

We support you in the conformity assessment procedure in the UK so that you can continue to place your machinery on the market there safely.



Workplace safety

Machinery Safety Evaluation

You get an efficient and compact overview of the safety and conformity status of your machines, including a dashboard and recommended actions for risk reduction.

Lockout Tagout System

Our customised lockout tagout (LoTo) measures guarantee that staff can safely control potentially hazardous energies during maintenance and repair.



Inspection of Safeguarding Devices

With our independent, ISO 17020-compliant inspection body, which is accredited by the German Accreditation Body (DAkkS), we can guarantee objectivity and high availability of your machines. Pilz GmbH & Co. KG, Ostfildern, operates an inspection body for plant and machinery, accredited by DAkkS.

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PILZ THE SPIRIT OF SAFETY