



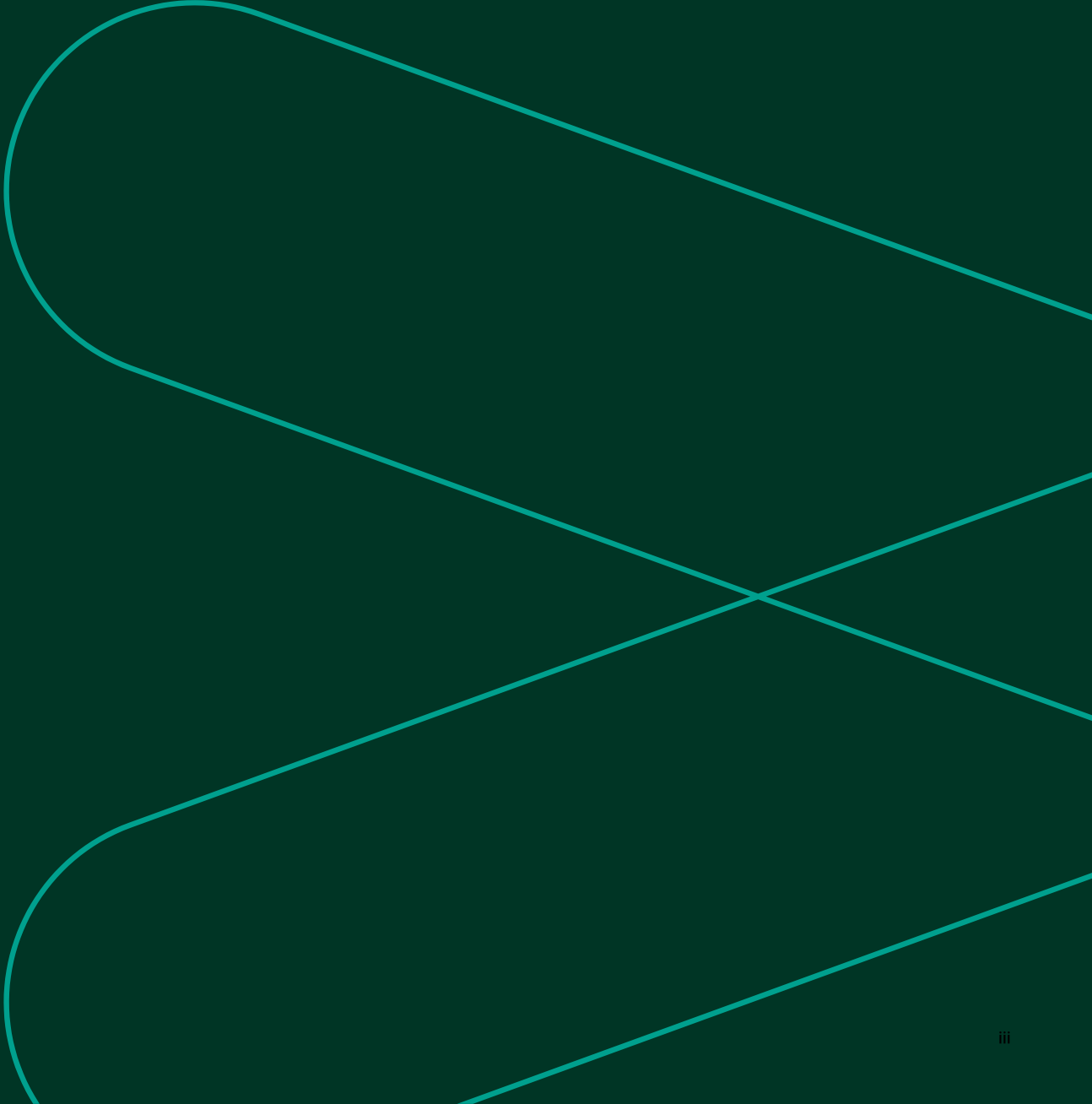
Nexus Controls Training Academy



Nexus Controls

a Baker Hughes business

Nexus Controls Training Academy

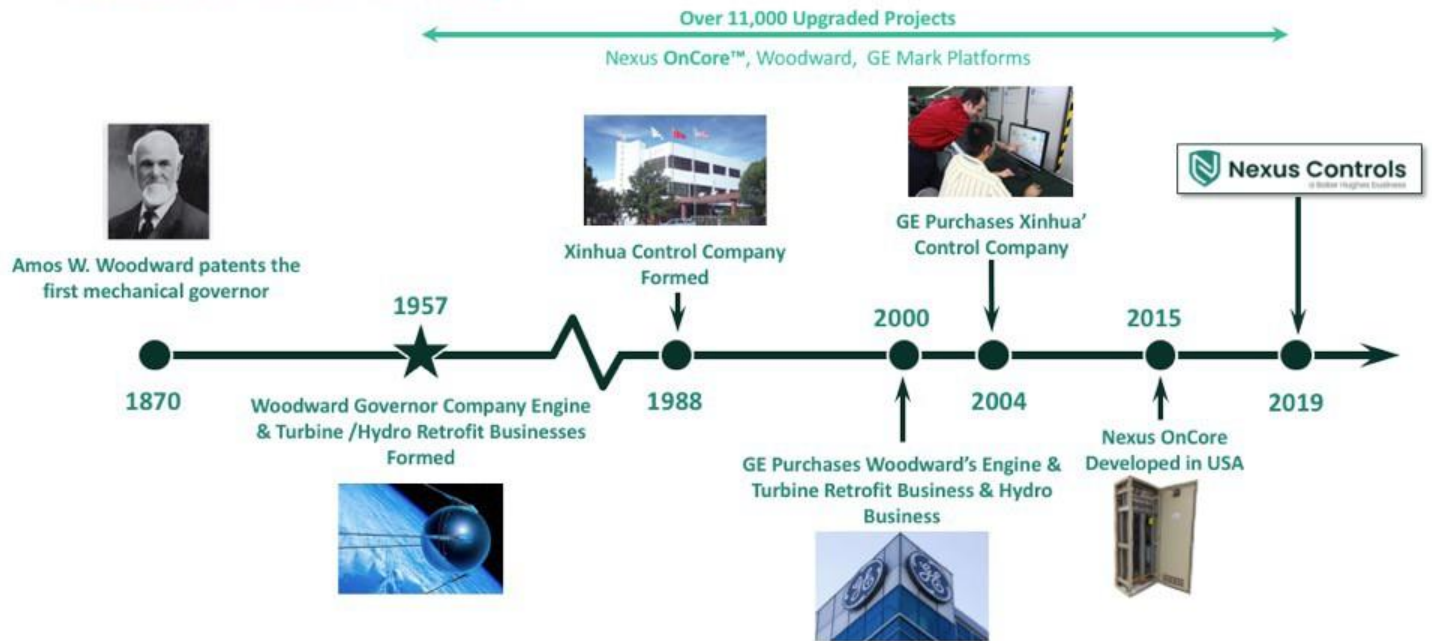


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Nexus Controls History



Introduction

Nexus Controls LLC (formerly GE Energy Control Solutions) is a part of Baker Hughes Digital Solutions Business. With over 40 years of digital controls experience, certified instructors with +20 years of field and instructing experience, Nexus Controls has been helping customers develop their field teams to operate and maintain their assets in line with world-class standards. Training is focused on developing operators, control engineers and instrumentation technicians' skills and giving them enough practice before dealing with actual machines and plants. Nexus Controls has developed all sorts of simulation software applicable for all types of applications either for Nexus Controls or non-Nexus Controls equipment. This rich library has earned the Nexus Controls training special recognitions by customers for being realistic and relevant to customer's installed base. Nexus Controls has recently developed a skills development program to develop control-room operators and control systems engineers. This program covers basic topics such as instrumentation and networking and builds on that to teach more complex topics related to controls logic and system troubleshooting.

Nexus Controls training covers the following areas and applications:

1. Unit control applications for both gas turbine and steam turbine on platforms ranging from Mark V, Mark VI and Mark VIe. This training can be provided for Nexus Controls and Non-Nexus Controls units equipped with a Nexus Controls control system.

2. Electrical control training:
 - a. Excitation control application using EX2100 and EX2100e.
 - b. Static starter application (LCI) using LS2100e
 - c. Generator protection panel (GPP)
3. Plant control (for power generation) using distributed control system (DCS)
 - a. Using Mark VIe platform
 - b. Using Nexus platform
4. Compressor control training (ITCC)
5. HMI software training
 - a. Cimplicity HMI
 - b. Historian HMI
6. Operators training including:
 - a. Heavy duty gas turbine
 - b. Steam turbine
 - c. Nexus Controls LM aero-derivative gas turbine
 - d. Balance of plant (BOP)
7. Network management and cyber Nexus OTArmor Security
8. Woodward operation and maintenance courses

Training is not one time, one class, one subject matter, but rather a continuous path of learning for plant personnel to gain the knowledge needed to achieve success in running an efficient, well-operated and well-maintained plant. Our instructors, training options, and learning paths will help you achieve these goals.

Training technical levels

Training courses have been built to address different technical levels

Operations

Maintenance

Engineering

- Operators technical training
- Instrumentation and control maintenance training
- Engineering training

1. Operators technical training

Courses offered to enhance operators' competence which directly reflects on plant availability and reliability. Several courses are offered to operators at different levels for different applications

- DCS/BOP operations using Mark VI/e / Nexus control system
- CC (combined Cycle) CC DCS operations
- Gas/steam turbine using Mark VI/e/S control system
- Compressor operations
- Historian and HMI operation
- Excitation control and generator protection
- Gas/steam turbine operation fundamentals

2. Instrumentation and control maintenance training

These courses offer in depth knowledge of different plant control and measurement systems. With strong focus on troubleshooting and maintenance techniques, these courses are excellent fit for instrumentation, maintenance and control professionals

- Mark VI/e/S control systems
- Nexus control systems
- EX2100/e excitation control system
- Generator protection panel
- Compressor control
- SC/BOP DCS controls
- CC (combined Cycle) CC DCS advanced controls
- Industrial networks and Cyber security

3. Engineering advanced training

These courses offer in depth knowledge of different plant control and measurement systems. With strong focus on engineering techniques, these courses are excellent fit for control professionals

- Mark VI/e/S control systems
- Nexus control systems
- EX2100/e excitation control system
- Generator protection panel
- Compressor control
- SC/BOP DCS controls
- CC (combined Cycle) CC DCS advanced controls
- Industrial networks and cyber security

Training delivery options

1. Site-specific courses



Those are tailored courses specifically to your site, which can be held either at your site or at one of BH facilities where, site-specific material and software is used during training course.

The site-specific offerings provide the students with comprehensive training of their Nexus Controls equipment.

The training provides the student with an overview of systems and major components using the site-specific manuals, configurations, drawings, software (when available), and utilizing simulations.

After training, the students are able to locate those same components in the plant with a thorough understanding of each system, major components, and how the system operates, enabling successful operation and maintenance of the plant.

2. Remote live instructor courses



Remote training service connects your staff with our industry leading instructors without the need for expensive travel. Gain remote access to our virtual classroom in our instructor led skill development courses.

Nexus Controls is offering a new remote training option for customers who are seeking to improve their field personnel skills in a challenging business environment. This remote training solution

is most suitable for customers:

1. With employees at restricted-access sites
(e.g. employees in lockdown situation like the COVID-19 or in extreme remote locations)
2. With strict budget limitation on travel and living expenses
3. With employees seeking to gain credit towards professional development for professional licensing

The Nexus Controls remote training solution provides a mix of audio, visual and virtual hands-on workshops with remote connectivity and control of training simulations to practice different scenarios with software logic and troubleshooting exercises (kindly review the NC remote training flyer at the end of this documents).

3. Open enrollment courses



Open enrollment courses are generic in content, which are conducted at one of BH facilities worldwide. The courses have been designed to help customers maintain a work force skilled in controls, operations, and maintenance. In addition to offering the same high-quality training as our site-specific courses, the Open enrollment courses offer the opportunity to train with students from around the world. They also offer a cost-effective training alternative for customers with small staffs or new team members.

Courses are conducted during normal business hours for the region, with no evening sessions. Course size is limited to maintain a successful learning environment and to allow sufficient time for the hands-on portion of the training. Lectures and supporting technical manuals are presented in English. Please, check our Website for further details on open courses (<https://controlsolutionstraining.com/>)

4. Informal onsite coaching



- We bring the coaching program to your site with our standard 2-day informal training option.
- Product specific overview presentations with Q&A with a certified FSE
- Use of as-installed equipment at customer site



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Nexus Controls skills development programs

Nexus Controls works with you to develop a comprehensive skills development program specifically designed to address your needs. A comprehensive Skills Development program will help accelerate the technical competence of your staff and maximize your ROI on training investments.

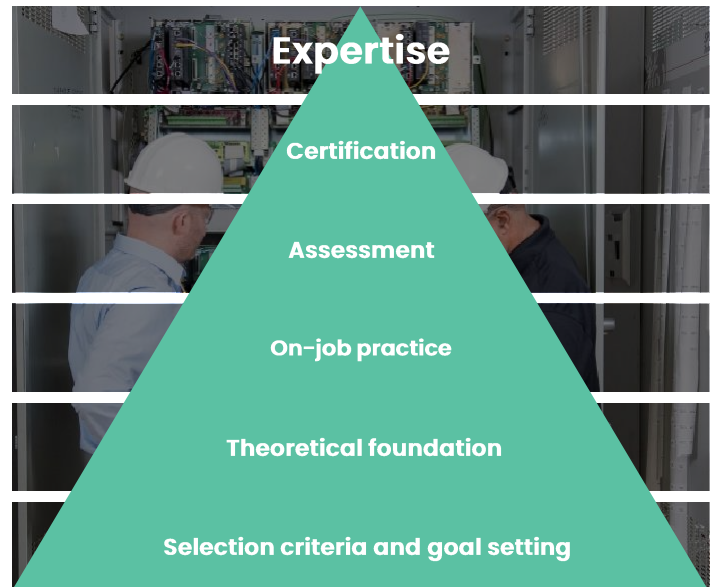
The **first step** in our skill development program is establishing a role-based competency matrix. This will be achieved by combining your organization's job descriptions and our Nexus Controls Learning Paths. All the delegates will be assessed against competency matrix specific to their role to identify skills and competency gaps. Based on the skill gaps identified, Control Systems deployed at site and site operational constraints a roadmap to build sustainable competencies will be developed.

By using **customized training** content and state of art training aids our certified instructors will conduct learner-centered training sessions at your site. Later, employees will work on pre-defined **on-job training** opportunities under the **mentorship** of our subject matter experts to acquire valuable practical skills and build confidence in facing key challenges in your facility.



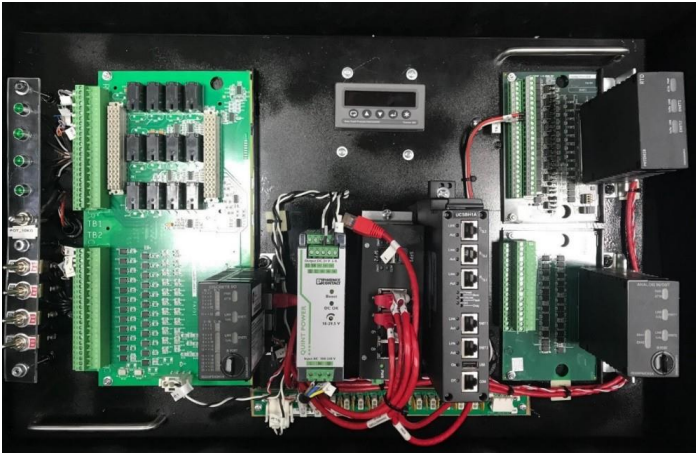
Fast-track to excellence

Customized training program (based on customer job description and existing installed base) providing a mix between theoretical and practical sessions. With this formula for accelerated-learning, our clients are able to achieve world-class certification of their personnel and enjoy the highest ROI on their training budgets.



Training simulators

Mark VIe portable training kit



The Mark VIe portable trainer includes:

- 1 UCSA\B processor board
- 1 PDIO pack mounted on TDBS + WROB terminal board for discrete I/O
- 1 PAIC pack mounted on STAI terminal board for analog I/O
- 1 power supply
- 1 network switch for IONet and external communications
- 4 on/off toggle switches to mimic digital inputs
- 4 lights for analog output simulation
- 1 potentiometer for analog input simulation
- 1 analog\RTD meter for analog output\RTD value display
- 1 PRTD pack mounted on SRTD terminal board for RTDs

Portable kit would help trainees to:

- Communicate with Mark VIe controller
- Troubleshoot and communicate with Mark VIe IO modules
- Terminate different IOs to Mark VIe TBs
- Download software and normalize IOPacks
- Hardware components online/offline replacement
- Simulation of different IO combinations
- Normally software provided with the kit will be full simulation enabled which allows trainees to connect to kit and simulate full real-case scenario as unit start/shutdown/trip etc.

Simulation-enabled training laptops

Full simulation enabled laptops shall be provided as part of training tools, it has both application software and graphics software packages installed and functional.

This shall allow trainees to get full simulation capabilities with respect to unit startup, shutdown and trip simulation as well. Along with that, there shall be pre-configured labs for most of training sessions that will be conducted under supervision of instructor.

Upon request, site specific software and graphics could be provided along with simulation laptop however, this shall be highlighted during early training discussion.



Mark VIe TMR typical panel

Typical Panel help trainees to:

- Communicate with Redundant Mark VIe controller
- Redundancy Test
- Same experience as if you are working on actual onsite Panel
- Troubleshoot and communicate with Mark VIeIO modules
- Terminate different IOs to Mark VIe TBs
- Download software and normalize IOPacks
- Hardware components online/offline replacement
- Simulation of different IO combinations
- Normally software provided with the kit will be full simulation enabled which allows trainees to connect to kit and simulate full real-case scenario as unit start/shutdown/trip etc.



EX2100e training tools

For electrical sessions, standalone controller and network switch could be provided as supporting tool along with simulation laptops



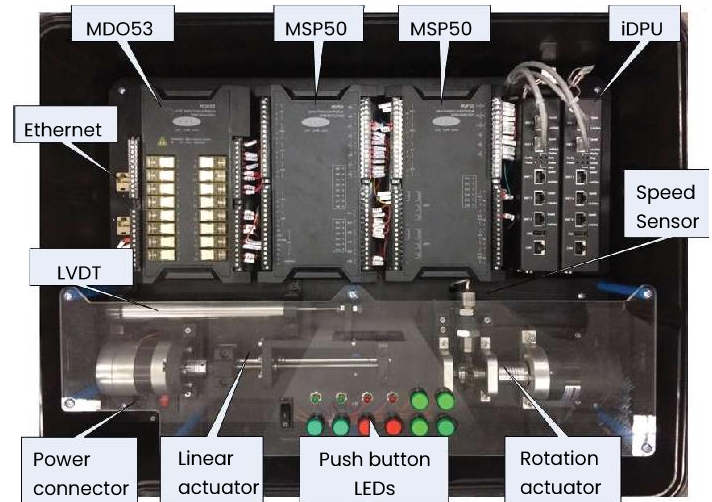
Nexus OnCore training tools

The Nexus OnCore portable trainer includes:

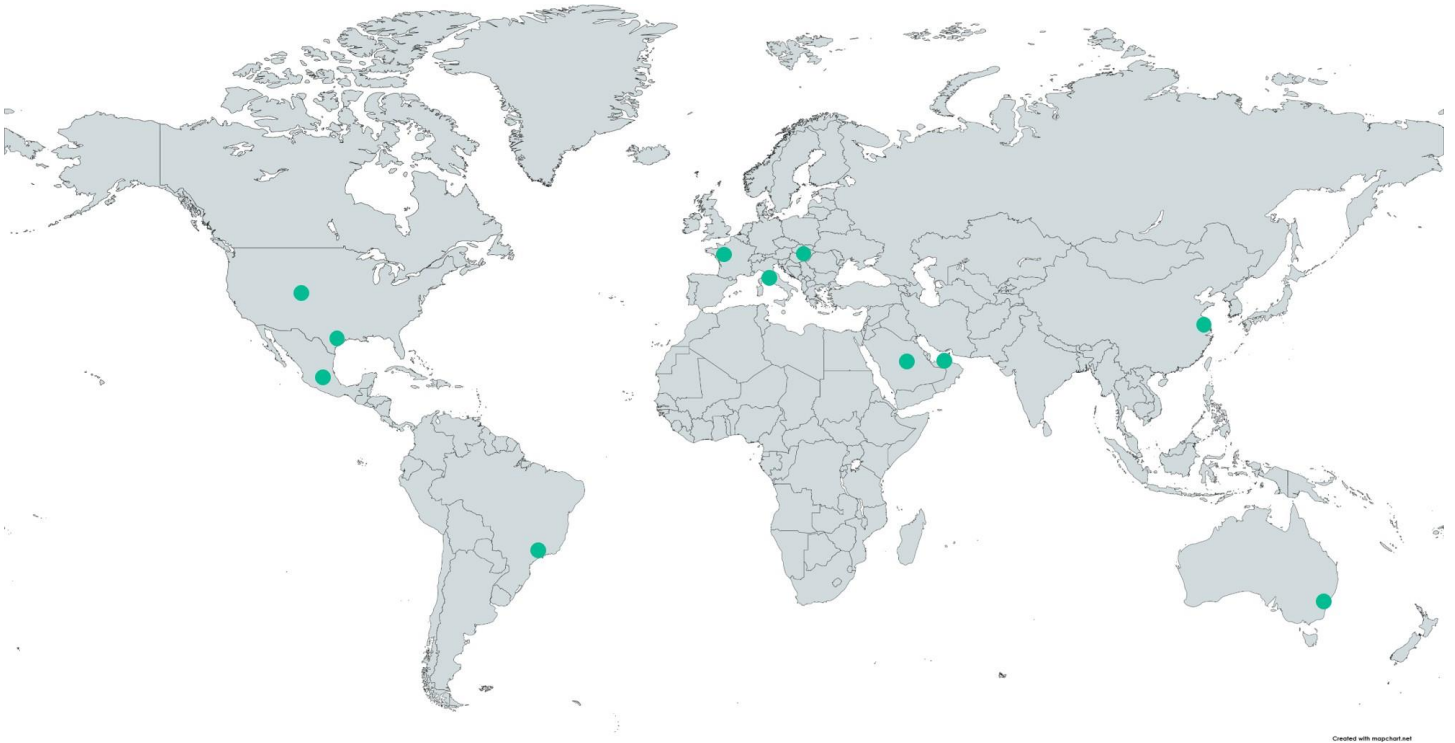
- 2 iDPUs processor board
- 1 MDO53 module for discrete I/O
- 1 MSP50 module for speed measurement
- 1 MVP50 module for valve control
- 2 power supplies
- 2 network switch for IONet and external communications
- Push buttons to mimic digital inputs
- LEDs for digital output simulation
- 1 LVDT for valve position
- 1 linear actuator for valve controlling
- 1 rotor for turbine speed simulation
- 2 speed sensors

Portable kit would help trainees to:

- Communicate with Nexus controller
- Troubleshoot and communicate with IO modules
- Terminate different IOs to Nexus TBs
- Download software and normalize IO modules
- Hardware components online/offline replacement
- Simulation of different IO combinations
- Valve calibration procedure
- Normally software provided with the kit will be full simulation enabled which allows trainees to connect to kit and simulate full real-case scenario as unit start/shutdown/trip etc.



Training locations



Created with mapchart.net

Longmont, CO
Houston, TX
Querretero, Mexico

Campinas, Brazil
Nantes, France
Fot, Hungary

Florence Italy
Dhahran, Saudi
Dubai, UAE

XinHua, China
Sydney, Australia

CEU credits

Our Training Program supports continuing education units (CEU) or continuing education credit (CEC) used in continuing education programs to assist professionals in maintaining license in their profession. Please indicate the request for this credit to your instructor so we can coordinate the appropriate evaluation and signoff for this continuing education program.

Control courses – MK VI

Mark VI modular trainings

Operations

CTRL01

MKVI
operator
course

(2 days)

Maintenance

CTRL02

MKVI
maintenance
course

(5 days)

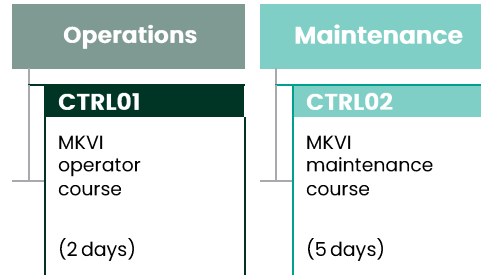


Mark VI operator course

Course description

This course is intended to familiarize operations team with MKVI and HMI main components

Course code	CTRL01
Target audience	Operations
Duration (days)	2
Training location	<ul style="list-style-type: none">• BH training facility• Customer site• Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2
System overview and architecture	Cimplicity alarm viewer basics
Instructor background	Cimplicity screens review
Course outline	Cimplicity startup and navigation
Mark VI system overview	Cimplicity trends
Equipment walk down	

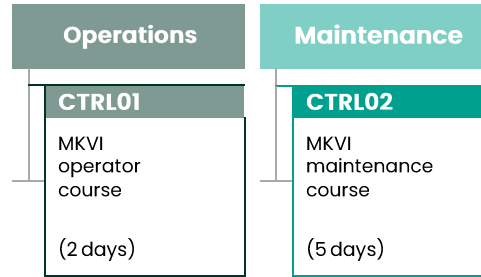
Mark VI maintenance course

Course description

This program is intended for all control technicians and engineers of existing, installed turbines (steam or gas) on which Mark VI control system has been installed. It is expected that the technicians will have hands-on experience with their turbine systems. This training will familiarize them with any hardware upgrades on the turbine in association with the upgraded control package, the hardware and software components of the control system providing the knowledge to work with the Mark VI control system in application with their turbine. It will develop skills in process alarm troubleshooting and analysis of the control code.

This course will cover:

- Troubleshooting techniques
- Nexus Controls ToolBox software
- Block functionality and use of help files
- How to trend signals within the application
- Watch window tool
- Troubleshooting CIMPLICITY screens
- CIMPLICITY (HMI) software and navigation of site screens
- Configure, monitor, and force various I/O types
- Navigation of site application using finder
- How to adjust and force signals
- How to read and troubleshoot alarms
- How to locate and read documents



Course code	CTRL02
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction A. Instructor background B. Course outline Equipment Review: A. MK VI system overview B. ToolBox structure C. MK VI I/O pack controls D. PDM E. Monitoring software	Toolbox tools Finder Watch windows Constants and variables Trenders View and troubleshoot IO diagnostic alarms	Maintenance Control cards and terminal board replacement Controller card replacement Permanent software changes Configuring IO points LVDT calibration	HMI CIMPLICITY (basic) A. UDH-networking B. Introduction to EGD C. Cimplicity Single screen troubleshooting D. Cimplicity communications E. Compiling and downloading	Troubleshooting A. Alarm tracing B. Add and modify alarms C. Viewing TripLog D. Capture blocks E. Trip history F. Course closure Q&A and session recap

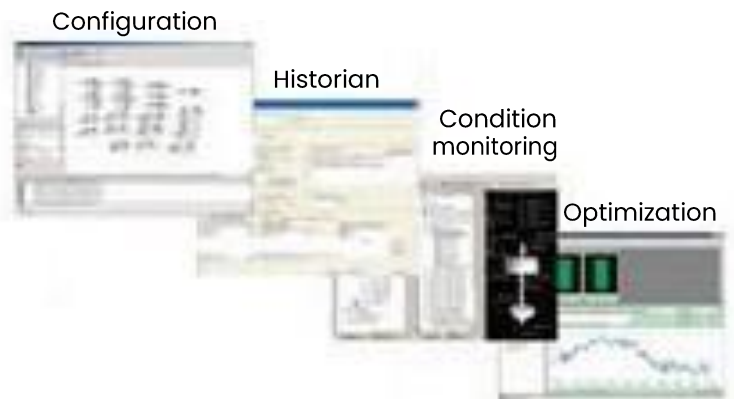
Nexus OnCore control courses

Operations	Maintenance
NX01	NX02
Unit Control/DCS operation course (2 days)	Unit Control/DCS maintenance course (5 days)
NX03	
Combined cycle (cc) power plant familiarization (5 days)	

Information network (PDH) –



Operator and engineers station



Gas turbine, HRSG, and generator controls #1



Static starter



Gas turbine, HRSG, and generator controls #2



Steam turbine and generator controls



Safety controller



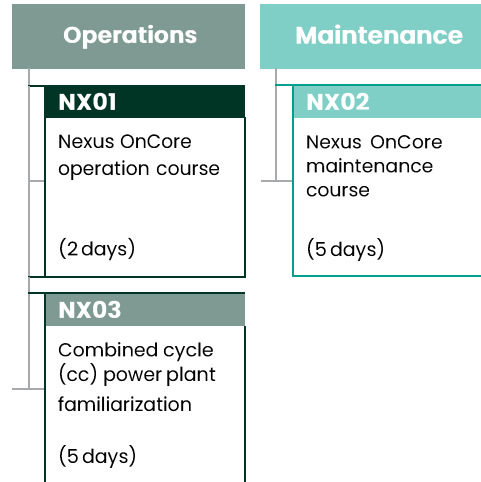
Balance-of-plant (BOP)

Nexus OnCore/OnCore safety operation course

Course description

This course offers basic knowledge for operators' team to effectively operate Nexus OnCore DCS controlled equipment at site. The course material will focus on graphics screens, alarm management and historian from operations perspective.

Course code	NX01
Target audience	Operations
Duration (days)	2
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2
Understand Nexus OnCore structure. Nexus OnCore software tools Alarm management	HMI screens Historian Hands-on session

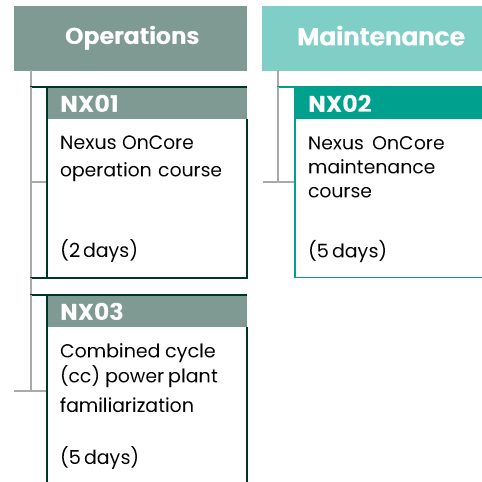
Nexus OnCore/OnCore safety maintenance course

Course description

This course is designed for the users using BH's Nexus OnCore (OC6000e)/OptimumC system.

In the course contents, the knowledge and skills needed in the system and hardware maintenance are covered, raising trainees the integrated knowledge and talents when they maintain the Nexus OnCore (OC6000e)/OptimumC.

Course code	NX02
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Understand Nexus OnCore structure Nexus OnCore software and application Exercises	Nexus OnCore hardware System configuration HMI configuration Hands-on session	Real time and historical data bases Arithmetic configuration Function blocks Hands-on session	I/O configuration Figure making System diagnostics Hands-on session	Controller card replacement Historian setup NTP configuration Hands-on session

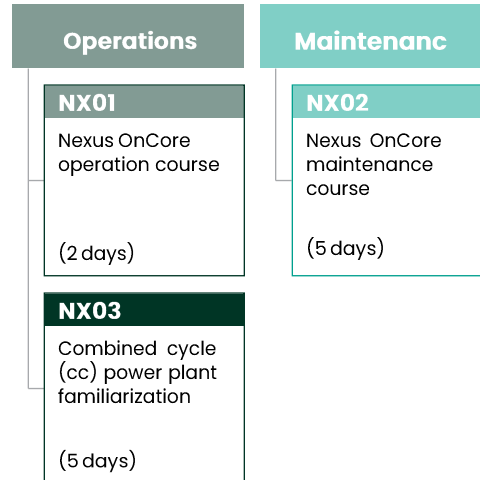
Combined Cycle (CC) power plant familiarization

Course description

This course introduces familiarization to a typical combined cycle (CC) power plant through a blended learning solution of classroom, videos and hands-on exercises. The course is focused on developing an understanding of how different systems and components operate in typical CC plant.

This course will provide basic knowledge on the following:

- Recognize the major components of a combined cycle power plant
- Explain major components architecture, construction and operation of the gas turbine
- Explain major components architecture, construction and operation of the steam turbine
- Explain major components architecture, construction and operation of the electrical generator
- Describe the operation of a combined cycle power plant
- Describe the balance of plant components



Course code	NX03
Target audience	Operations
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Power plant overview Gas turbine overview Gas turbine theory GT components GT compressor components GT combustion chamber and DLN components	GT emissions and control GT combustion turbine components GT Support systems A. Bearing lube oil B. Control/trip oil C. Inlet guide vanes D. Cooling and sealing air E. Atomizing air F. Compressor wash G. Water injection H. Gas system I. Liquid fuel system	J Starting system (load commutator inverter) A. GT protection B. GT control and operation systems Combined cycle theory Heat recovery steam generators Specific catalytic reduction	Combined cycle support systems, BOP systems A. Steam system B. Feedwater C. Condensate D. Demineralized water E. Condensers F. Circulating water	Steam turbine fundamentals ST maintenance considerations (GER 3620) AC power generation equipment Electrical distribution systems

Control courses – MK VIe

Mark VIe modular trainings

Operations	Maintenance	Engineering
CTRL03 MKVIe/S operator course (2 days)	CTRL04 MKVIe/S maintenance course (5 days)	CTRL05 MKVIe/S advanced maintenance course (10 days)
	CTRL06 Mark VI/e control migration from Mark V course (5 days)	
	CTRL07 Mark VI to Mark VIe platform upgrade maintenance (5 days)	



Mark VIe/S operator course

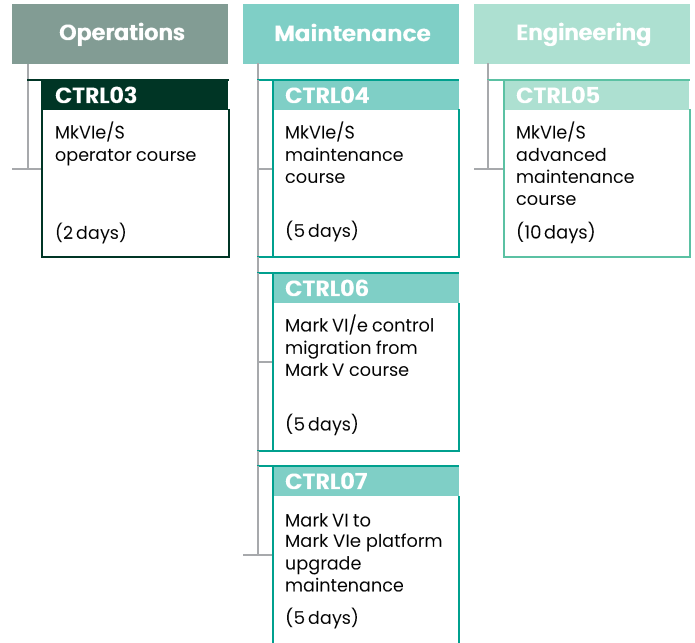
Course description

- This course is intended to familiarize operator teams with MKVIe and HMI upgrade main components
- Coaching with on-site equipment, equipment walk-downs, and question and answer sessions
- Classroom learning by presentation slides

Course code	CTRL03
Target audience	Operations
Duration (days)	2
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with customer specific simulated software and graphics

Course content and agenda

Day 1	Day 2
System overview and architecture	WorkstationST alarm viewer basics
Instructor background	Cimplicity screens review
Course outline	Cimplicity startup and navigation
Equipment review:	Cimplicity trends
MK VIe system overview	Historian PI (If applicable)
ToolboxST structure	
Equipment walk down	



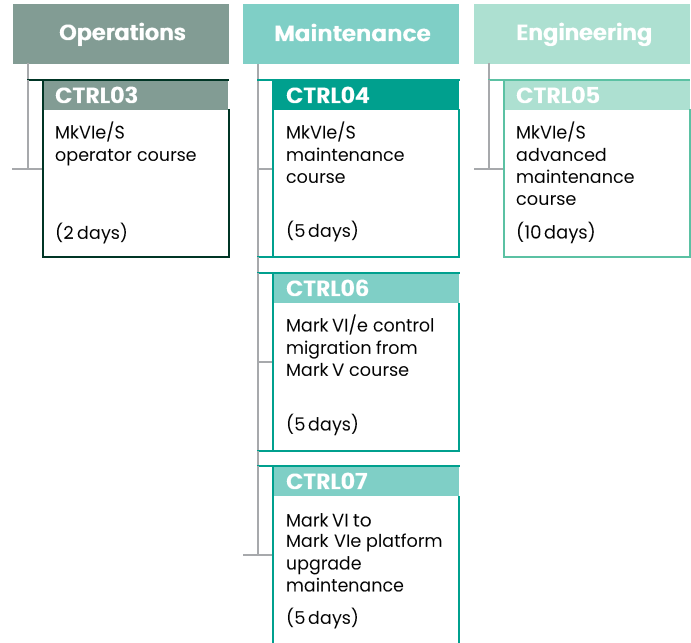
Mark VIe/S maintenance course

Course description

This program is intended for all control technicians and engineers of existing, installed turbines (steam or gas) BOP on which a new Mark VIe control system has been or to be installed. It is expected that the technicians will have hands-on experience with their turbine systems. This training will familiarize them with any hardware upgrades on the turbine in association with the upgraded control package, the hardware and software components of the control system providing the knowledge to work with the Mark VIe control system in application with their system. It will develop skills in process alarm troubleshooting and analysis of the control code. Depending on time opportunities there may be limited discussion on subjects such as LVDT calibration, Cimplicity software programming, sequence editing or diagnostic alarm troubleshooting. These topics will be agreed upon based on discussions with the instructor and the attendees.

This course will provide basic knowledge on the following:

- Gain the skills and confidence to perform system maintenance
- Learn and document the processes to complete control system maintenance duties
- Save time when troubleshooting the system and minimize system down time
- Gain an intermediate knowledge of the software tools
- Use the software tools for troubleshooting and understanding the system
- Apply intermediate knowledge of the software tools to make site specific improvements



Course code	CTRL04
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with customer specific simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction A. Instructor background B. Course outline System overview and architecture Cimplicity startup and navigation Workstation ST alarm viewer basics	ToolboxST basics Monitoring I/O Monitoring software	Finder and signal tracing Trender Constants and variables	Watch windows Alarm tracing Troubleshooting Cimplicity screens Viewing trip log data	View and troubleshoot diagnostic alarms Controller card replacement IO card replacement HMI backup and restore Course recap and closure

Mark VIe/S advanced maintenance course

Course description

This course is intended to familiarize trainees with the hardware and software components of the Nexus Controls Mark Vie control system. It provides detailed knowledge to troubleshoot and maintain the system as well as a basic introduction to HMI application.

It covers both hardware fundamentals and software developing environment basic knowledge (ToolboxST).

This course will provide basic knowledge on the following:

- Control system configuration
- Troubleshooting alarms
- Basic adjustments
- Customer screens and software
- Hardware and I/O configuration

- Alarms on the operator interface
- Mark VIe network configuration
- Hardware troubleshooting

Course code	CTRL05
Target audience	Engineering
Duration (days)	10
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with customer specific simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
<p>Introduction</p> <ul style="list-style-type: none"> A. Instructor background B. Participant background C. Course schedule <p>Control basics</p> <ul style="list-style-type: none"> A. Mark VIe overview and system architecture B. Mark VIe communication networks C. Operator interface familiarization D. ToolboxST application and Mark VIe system file basics 	<p>Hardware and I/O configuration and troubleshooting</p> <ul style="list-style-type: none"> A. I/O packs and terminal boards B. Controllers and power supplies C. Configuring digital I/O D. Configuring analog I/O E. Hardware and I/O troubleshooting 	<p>Troubleshooting alarms, shutdowns, and other fault conditions</p> <ul style="list-style-type: none"> A. Mark VIe software familiarization B. Variables and constants C. Tracing signals in customer's software using ToolboxST finder D. Viewing and collecting data using watch windows and trend recorder E. Basic troubleshooting of alarms and other fault conditions 	<p>Working with data and alarms on the operator interface HMI documentation and files</p> <ul style="list-style-type: none"> A. Operating and navigating graphical interface screens (Cimplicity) B. Graphical screen trends C. WorkstationST methods of data collection and alarm history 	<p>Basic adjustments</p> <ul style="list-style-type: none"> A. Adding alarms, events and SOE's to customer's software B. Adjusting constants and tables C. Servo LVDT calibration D. Making changes permanent
Day 6	Day 7	Day 8	Day 9	Day 10
<p>Mark VIe network configuration and troubleshooting</p> <ul style="list-style-type: none"> A. Mark VIe networks B. Peer-to-peer communications C. Using the system database for peer-to-peer communications D. Troubleshooting common communications issues and loss of data 	<p>WorkstationST for alarms, data captures and trip logs</p> <ul style="list-style-type: none"> A. WorkstationST overview and tools B. Viewing alarms using WorkstationST alarm viewer C. Configuring and viewing alarm history and trip logs D. Configuring and viewing data from trend recorder, capture blocks and DDR's 	<p>Advanced system level troubleshooting using customer screens and software</p> <ul style="list-style-type: none"> A. Advanced troubleshooting of alarms, shutdowns and other fault conditions using screens, worksheets and ToolboxST tools 	<p>Advanced system level troubleshooting using customer screens and software</p> <ul style="list-style-type: none"> B. Advanced troubleshooting of I/O faults using P&ID's, elementary drawings, worksheets, device summary and other site drawings 	<p>Advanced hardware troubleshooting</p> <ul style="list-style-type: none"> A. Hardware diagnostics and troubleshooting B. Hardware replacement C. I/O pack initialization D. UCCX controller initialization

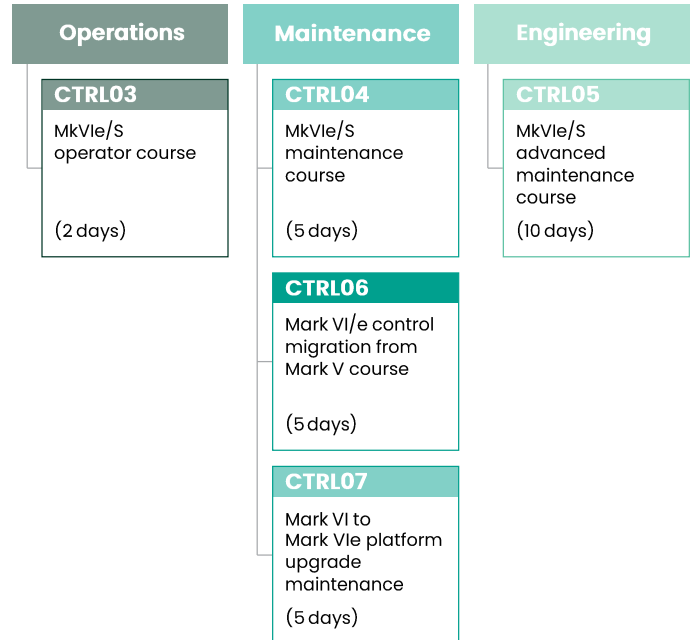
Mark VIe control migration from Mark V course

Course description

This training will familiarize students with the hardware and software components of the control system, changes to the HMI and the overall control system architecture. It will develop strong skills in process alarm troubleshooting and analysis of the control code. Additional training includes LVDT calibration, control interface (Cimplicity HMI) software programming, sequence editing, diagnostic alarm troubleshooting and advanced data collection techniques.

Please note: The training equipment (trainer) will not run the site software. It will operate on generic, machine-compatible software (i.e. if the site training is for a steam turbine, the trainer will operate using a 'generic' steam turbine). If the site software is available at the time of the training, it will be used to illustrate various aspects of the training material, but it will not be loaded on the trainer.

Course code	CTRL06
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with customer specific simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction Instructor background Student background and expectations Course schedule Nexus Controls documentation overview Nexus Controls documentation conventions	Panel / NetworkLayout Panel hardware HMI / Mk VIe File Structure	ToolboxST Tools: Finder Watch windows Constants and variables Trenders View and troubleshoot IO diagnostic alarms	Maintenance: IOPack and terminal board replacement Controller card replacement Permanent software changes Editing application software Configuring IO points LVDT calibration	HMI CIMPPLICITY (basic): A. UDH-networking B. Introduction to EGD C. Cimplicity single screen troubleshooting D. Cimplicity communications E. Cimplicity single screens F. Compiling and downloading

Mark VI to Mark VIe platform upgrade maintenance

Course description

This program is intended for personnel whose site has a Mark VIe control migration from Mark VI control system. The training will familiarize students with the hardware and software components and provide detailed knowledge to troubleshoot and maintain the control system and associated equipment.

The course is modular and includes training material derived from actual Mark VIe control migration from Mark VI control installed systems. Training is delivered in short lessons followed by labs. The hands-on labs are performed on an HMI computer specially programmed to simulate a turbine. The labs are progressively challenging and assist the students to learn the basics and build up to intermediate skills including alarm and system troubleshooting. **Please note:** This course is instructed with a generic gas turbine control simulation appropriate for training. If available, the site software will be presented in demonstrations.

This course will provide knowledge on the following:

- Learn and document the processes to complete control system maintenance duties
- Save time when troubleshooting and minimize system down time
- Gain a fundamental knowledge of the software tools
- Use the software tools for troubleshooting and understanding the system

Course code	CTRL07
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with customer specific simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
<p>Introduction</p> <p>Instructor background and participant background</p> <p>System overview and architecture</p> <p>Mark VIe control migration from Mark VI control product line, major system components, terminology, communications, control and protection schemes, and redundancy options</p>	<p>Nexus Controls provided documents and Drawings</p> <p>Identify the control system documentation provided by Nexus Controls</p> <p>Discover Web based access to site specific documentation</p> <p>HMI login, default accounts, default passwords</p> <p>Learn the default user accounts to login into the HMI and user access</p> <p>Learn the basic concepts of cyber security</p> <p>Login/out of the HMI server and explore the various permissions of the user accounts</p>	<p>Navigate CIMPPLICITY™ screens to identify signals from the turbine</p> <p>Understand the logic and configuration features</p> <p>ToolboxST™ application basics</p> <p>Learn the terminology used within the ControlST™ software suite and ToolBoxST™ application</p> <p>Monitoring inputs and outputs (I/O)</p> <p>Monitoring software</p>	<p>Learn the various reports that can be generated from the ToolBoxST™ software and their uses for troubleshooting</p> <p>Finder</p> <p>Use the I/O report to help find I/O points</p> <p>Trender</p> <p>Learn to open the trender tool, add traces by using various methods, and view live control data</p> <p>Constants and variables</p> <p>Make online changes to constants and variables</p> <p>Synchronize control constant live values and initial values</p>	<p>Learn how to create and use watch windows</p> <p>WorkStationST™ alarm Viewer</p> <p>Alarm viewing, tracing, and troubleshooting</p> <p>View and troubleshoot Diagnostic alarms</p> <p>Cimplicity™ software basics</p> <p>Viewing and analyzing recorder Data</p> <p>Review the new hardware components in the system</p> <p>Controllers</p> <p>I/O interface card</p> <p>Power distribution</p> <p>Replacing I/O cards and terminal boards</p> <p>Replacing controllers and I/O interface cards</p>

Electrical courses

Electrical modular trainings

Operations	Maintenance	
EX01 Excitation – EX2100e generator operation (2 days)	LCI01 LS2100 LCI for turbine static start (3 days)	ELEC01 Excitation EX2100e/LS2100e maintenance (5 days)
	LCI02 LS2100e LCI for turbine static start (3 days)	GPP01 Generator protection (GPP) (4 days)
	EX02 Excitation EX2100e maintenance (5 days)	



Excitation – EX2100e generator operation

Course description

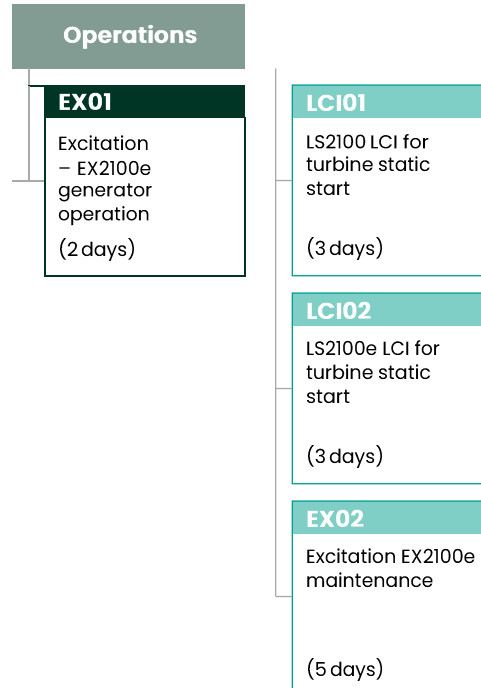
The course is designed for operations personnel who operate a generator with an EX2100e generator excitation system. The course focuses on safe generator operation and fundamentals supporting the safe and hands-on operation with a portable simulator.

Training is performed with lectures and demonstrations using an EX2100e simulator. An EX2100e simulator and operator station will be available as well as site-specific software for discussion. Site specific documentation and training manuals provided to the students will be used in the training.

This course will provide basic knowledge on the following:

- Safe off-line and on-line operation of the generator
- How to identify limiter indications
- How to read alarm and fault messages

Course code	EX01
Target audience	Operations
Duration (days)	2
Training location	• Customer site
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2
EX2100e system hardware overview Generator fundamentals A. Off-line operation B. Off line limiters	Generator fundamentals C. On-line operation D. Capability curve E. On line limiters EX2100e software overview A. EX2100e software overview for Use of displaying alarm and fault messages

LS2100 LCI for turbine static start

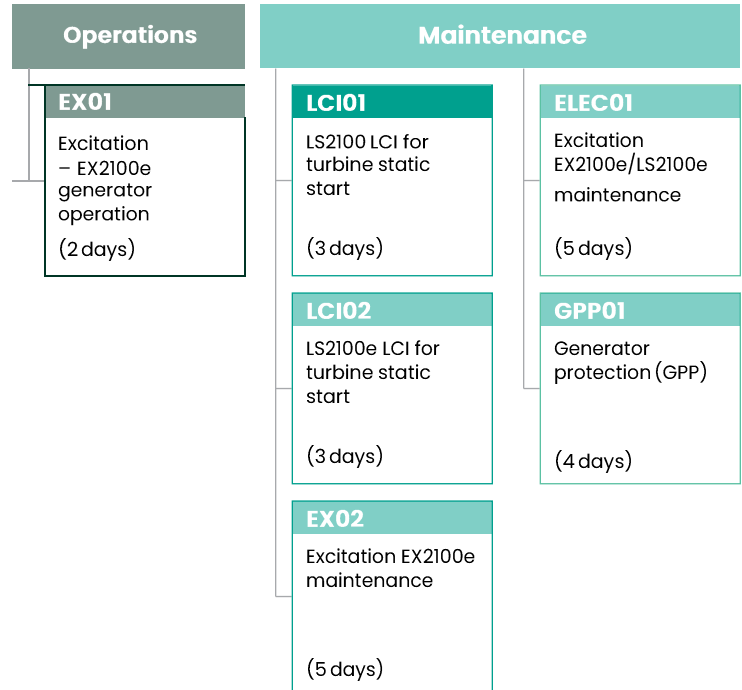
Course description

This course is designed for engineering and maintenance personnel who configure and maintain the LCI static starter. Laboratory assignments include hardware identification and Control system ToolBoxST™ communications, understanding the monitor commands. This course will utilize a single simulator. Lectures and hands-on exercises are used to maximize student material retention.

This course will provide basic knowledge on the following:

- Describe how the LS2100 changes the speed of the generator/motor
- Perform maintenance on the pump panel
- LSB file use with the control system ToolBoxST™
- Troubleshoot the connectivity between the LS2100, the turbine control, and the exciter

Course code	LCI01
Target audience	Maintenance
Duration (days)	3
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3
<p>Static starter theory and major components</p> <p>Elementary diagram reading</p> <p>Pump panel operations maintenance and troubleshooting</p> <p>Loading software programs</p> <p>Control system ToolBoxST™ familiarization</p>	<p>Trend recording with capture buffer for troubleshooting</p> <p>Controller functions</p> <p>Real-time recording</p>	<p>Alarm messages</p> <p>Scaling feedback signals, and nulling offsets</p> <p>Troubleshooting faults and alarms</p> <p>Q&A and wrap-up</p>

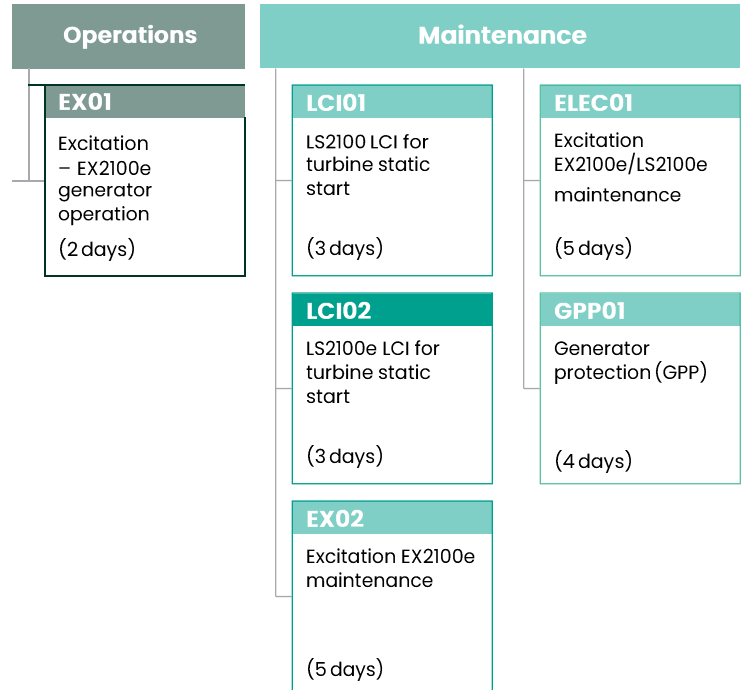
LS2100e LCI for turbine static start

Course description

This course is designed for engineering and maintenance personnel who configure and maintain the LCI static starter. Laboratory assignments include hardware identification, control system ToolBoxST™ communications, and user diagnostic tests. This course will utilize simulators, and a walk through (if available) of your full functioning LCI starter. Lectures and hands-on exercises develop a thorough understanding of the equipment.

This course will provide basic knowledge on the following:

- Describe what the LS2100e is used for
- Describe how the LS2100e changes the speed of the generator/motor
- Perform maintenance on the pump panel
- Develop a thorough understanding of the .tcw file used in the ControlST™ tools
- Understand and troubleshoot the connectivity between the LS2100e and the turbine control.



Course code	LCI02
Target audience	Maintenance
Duration (days)	3
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3
<p>Hardware overview</p> <p>Liquid cooling system power conversion theory</p> <p>Elementary diagram reading</p> <p>Pump panel operations maintenance and troubleshooting</p> <p>Static starter, operation and theory</p>	<p>Understanding the software (inner and outer loop)</p> <p>Loading UCSB runtime</p> <p>ControlST™ familiarization</p>	<p>Trend recording with capture buffer for troubleshooting</p> <p>Understanding the HSSL status diagram</p> <p>DDR familiarization</p> <p>UCSB controller functions</p>

Excitation EX2100e maintenance

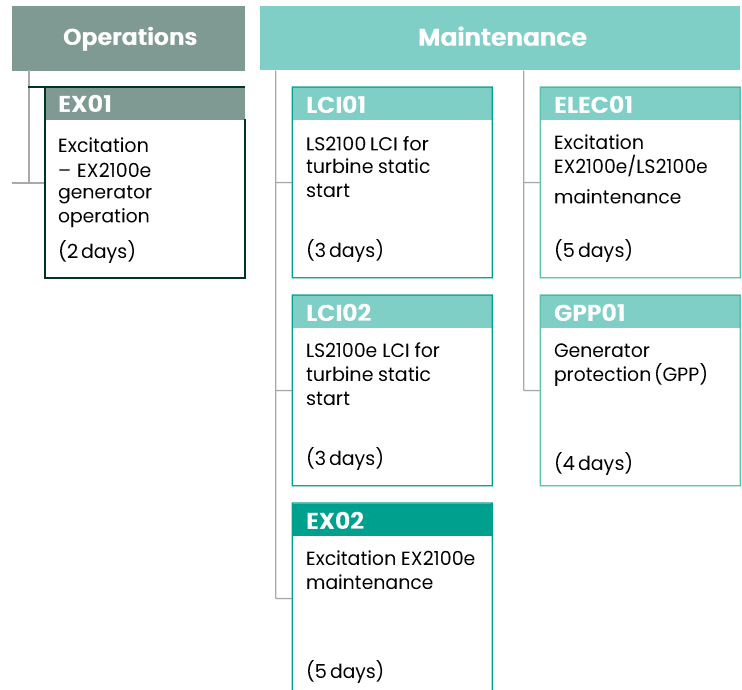
Course description

The EX2100e course is an advanced level training course covering EX2100e and control systems toolbox. These systems are common to gas and steam turbine generators up to 1500 M watts. The classroom presentation will cover: the function, calibration of the standard excitation modules, auxiliary equipment, software tools and some options for each excitation system.

At the completion of the training, the participants should be able to:

- Describe the function and operation
- Perform basic startup checks
- Perform basic trouble shooting techniques on: generators, excitation systems and Solid-state power conversion modules an operating power plant
- Startup, calibrate, and trouble shoot to the component level the EX2100e generator excitation systems

Course code	EX02
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction Instructor background Student background Class expectations Exciter overview Role of excitation system Exciter major components Off line generator fundamentals and synchronizing Major components of an excitation system Generator operation off line Excitation off line protective settings Synchronizing	On line generator operation and shutdown Loading the generator Watts and VARs Generator on line curves On line exciter protection Description of PSS operation (If applicable) Classroom demonstrations of settings using trainer Exciter hardware and excitation drawings Description of exciter hardware components Recommended maintenance of exciter Local keypad	Exciter software Ethernet connections Nexus Controls toolbox demonstration Navigating using toolbox Simulation of operating a generator	Troubleshooting and maintenance Fault indications Component maintenance	General troubleshooting guidelines HMI excitation screens Lockout and tag out

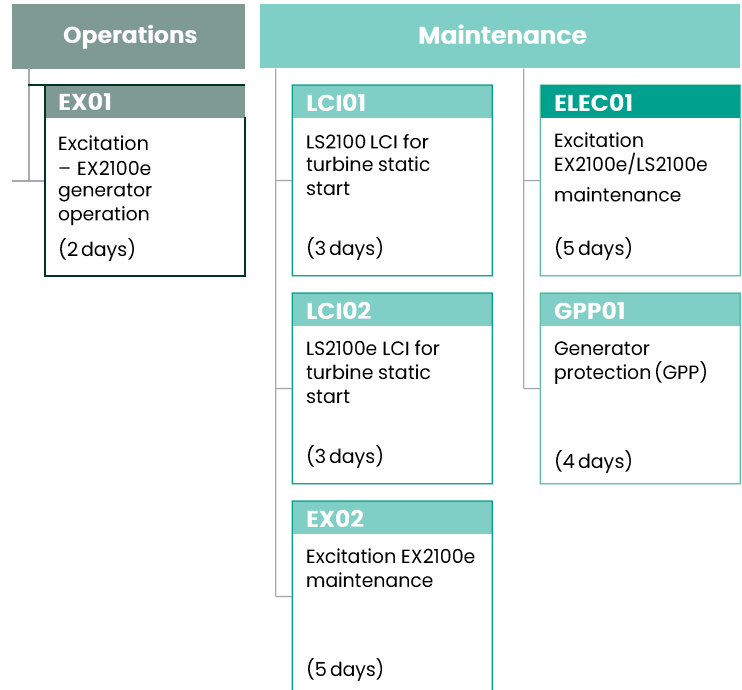
Excitation EX2100e/LS2100e maintenance

Course description

This course covers generator operation, excitation, LCI and the functions of the generator protection panel. The course is taught using site drawings and system settings.

The course is designed to stress the safe operation of the generator as well as enhance the student's background in maintenance and troubleshooting skills on the EX2100e.

Course code	ELEC01
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
<p>Introduction</p> <p>Instructors background</p> <p>Student background</p> <p>Class expectations</p> <p>Exciter overview</p> <p>Role of excitation system</p> <p>Exciter major components</p> <p>Off line generator fundamentals and synchronizing</p> <p>Major components of an excitation system</p> <p>Generator operation</p> <p>Off line</p> <p>Excitation off line protective settings</p> <p>Synchronizing</p> <p>Classroom demonstrations of settings using trainer</p>	<p>On line generator operation and shutdown</p> <p>Loading the generator</p> <p>Watts and VARs</p> <p>Generator on line curves</p> <p>On line exciter protection</p> <p>Description of PSS operation (If applicable)</p> <p>Classroom demonstrations of settings using trainer</p> <p>Exciter hardware and excitation drawings</p> <p>Description of exciter hardware components</p> <p>Recommended maintenance of exciter</p> <p>Local keypad</p> <p>Print reading exercises</p> <p>Excitation elementary drawings</p> <p>Excitation instruction manuals</p> <p>Classroom exercises</p>	<p>Exciter software</p> <p>Ethernet connections</p> <p>Nexus Controls toolbox demonstration</p> <p>Navigating using toolbox</p> <p>Simulation of operating a generator</p> <p>HMI excitation screens</p> <p>Troubleshooting and maintenance</p> <p>Lockout and tag out</p> <p>General troubleshooting guidelines</p> <p>Fault indications</p> <p>Component maintenance</p>	<p>LCI static start</p> <p>Hardware overview</p> <p>LCI software main components and familiarization</p> <p>Running the diagnostic tests</p> <p>Troubleshooting faults and alarms</p>	<p>Trend recording with capture buffer for troubleshooting</p> <p>Understanding the HSSL status diagram</p> <p>DDR familiarization</p> <p>UCSB controller functions</p> <p>Board replacement</p> <p>LCI replacement</p>

Generator protection (GPP)

Course description

Generator protection (GPP) is intended for electrical maintenance team to get familiarization with Nexus Controls UR family of relays. It covers both hardware and software parts.

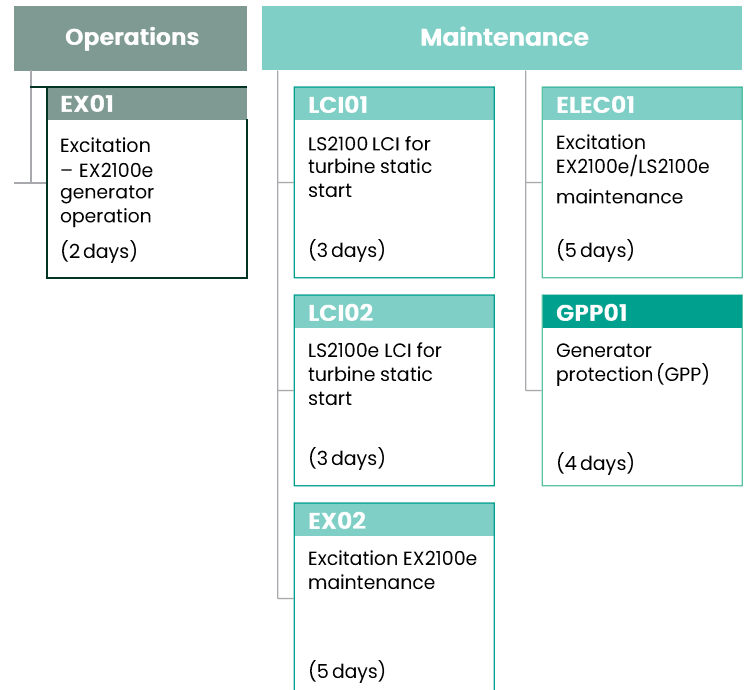
Course has been built for those involved in protecting power plant and Utility power systems who require an understanding of the principles of protective relaying specially site, maintenance and field engineers who will be installing and commissioning Nexus Controls UR relays will benefit from this course. Students range from recent graduates entering the field of operations and maintenance staff to seasoned professionals who require an update on the latest technology.

Site specific software need to be shared before training.

Prerequisites

- Basic understanding of electrical circuits
- Microsoft windows Knowledge
- Attendees / students to bring a laptop computer to realize the practical exercises

Course code	GPP01
Target audience	Maintenance
Duration (days)	4
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3	Day 4
Introduction Instructor background Student background Class expectations GPP overview System overview	Communication basics Basic synchronous generator protection theory UR relay hardware overview UR modular concept Specifications and hardware configuration Mechanical installation and wiring Firmware overview Architecture UR relays specifics	Generator protective functions Transformer protection Keypad operations UR relay software Relay software overview Establishing communication to the relay	Oscillography Diagnostics (events, waveform, data log) Loading and saving relay settings files Firmware upgrade Q&A session Practical hands-on training

Turbine courses

Operations

GT01

Gas turbine –
operations – field
operator course

(5 days)

GT02

Gas turbine
– operations –
control room
operator course

(5 days)

ST01

Steam turbine –
operations

(5 days)

Maintenance

GT03

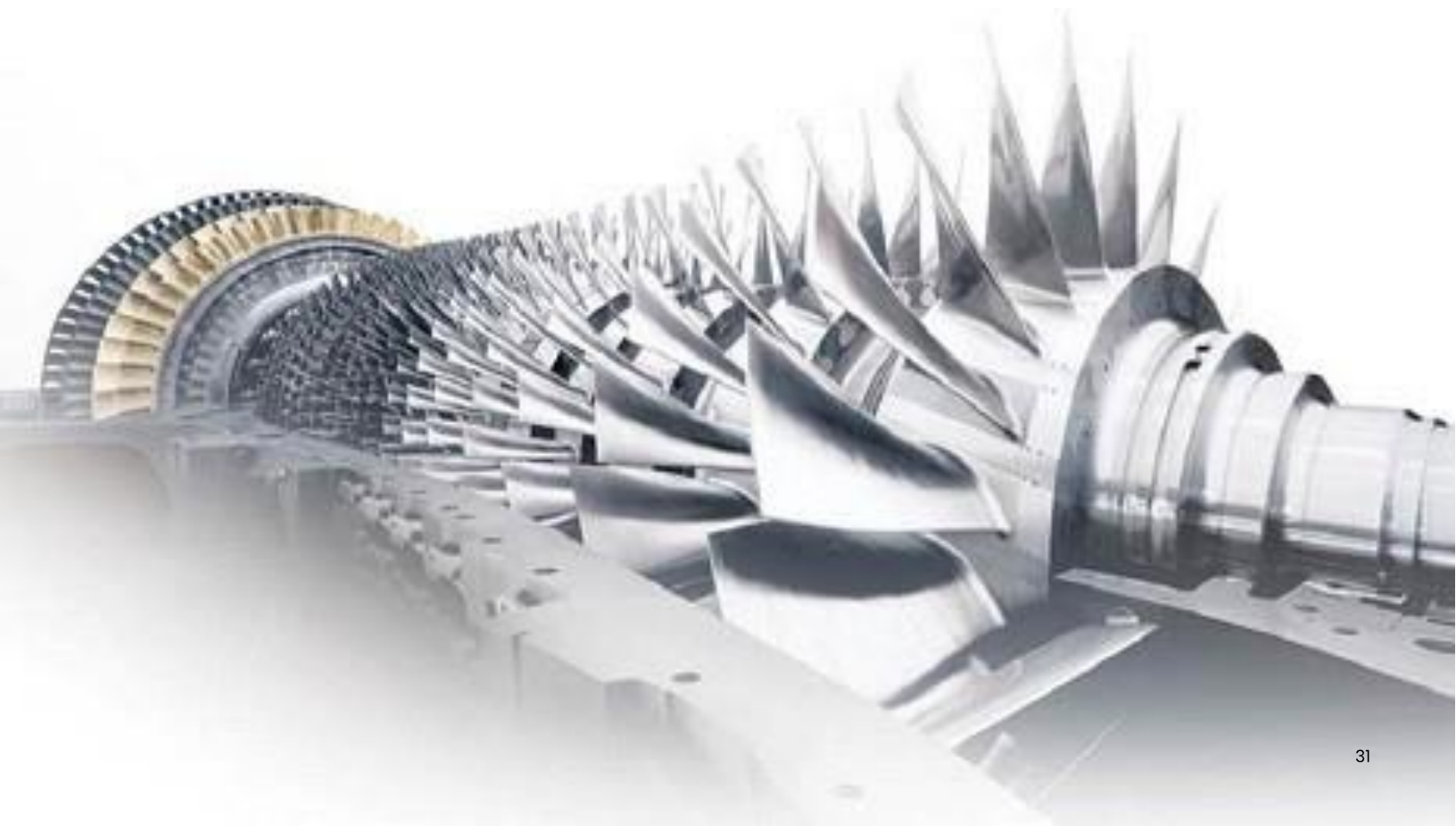
Mark VI/e gas
turbine control
system operation
and maintenance

(10 days)

AER01

Mark VI/e Nexus
LM aeroderivative
maintenance and
troubleshooting

(10 days)



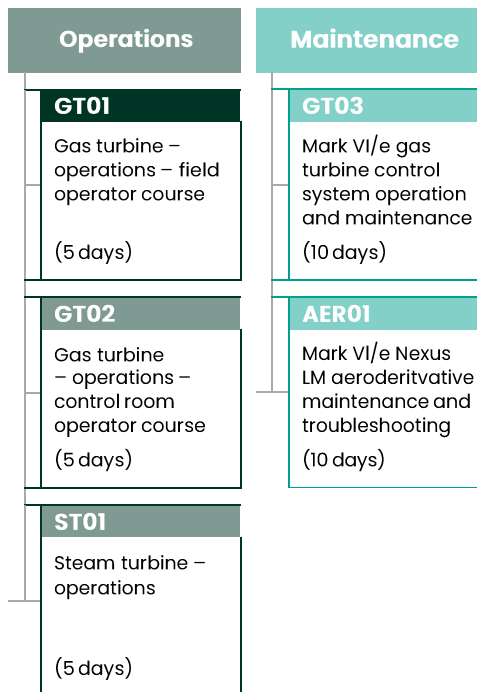
Gas turbine – operations – field operator course

Course description

This site-specific course is designed to enable, supervisors, outside operations to operate Nexus Controls designed heavy-duty gas turbine generator units. The course focus on instrumentation and system functions from the perspective of an outside operator who walks down the unit. No training laptops/simulation (ML and GEK numbers are based on 7FA.05)

If the course is held at the customer's location it will include site visits to familiarize personnel with the physical layout of the gas turbine, and the location of the various system components, and provide personnel the opportunity to correlate the system piping schematics to the respective system hardware.

Course code	GT01
Target audience	Operations
Duration (days)	5
Training location	• Customer site
Simulation tools and labs	Simulation laptops with similar application



Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
<p>Introduction</p> <p>Instructor background</p> <p>Gas turbine description and key documentation</p> <p>Gas turbine description (GEK 120519)</p> <p>Operation and maintenance manual (customer specific)</p> <p>Control specification (customer specific, A010)</p> <p>Device summary</p> <p>Turbine control devices (GEK 116642 / ML 0415)</p> <p>Speed sensor, vibration sensor, turbine pressure and temperatures</p>	<p>Air systems</p> <p>Inlet and exhaust system</p> <p>Cooling and sealing air (GEK 116773)</p> <p>Compressor bleed valve</p> <p>Inlet bleed heat (GEK 117057 / ML 0432)</p> <p>Automizing air</p> <p>Purge air</p>	<p>Oil systems</p> <p>Lube oil (ML 0416)</p> <p>Hydraulic and control oil (ML 0434)</p> <p>Variable geometry (VIGV, VSV, etc.)</p> <p>Lift oil</p>	<p>Fuel and watersystems</p> <p>Dry low NOx</p> <p>Gas fuel conditioning (ML0482)</p> <p>Gas fuel system (ML 0420/0962)</p> <p>Liquid fuel system (ML 0420/0961)</p> <p>Water injection system (ML 0420)</p> <p>Steam injection system (ML 0431)</p> <p>Cooling water system (ML 0420)</p> <p>Water wash (ML 0442)</p>	<p>Auxiliary systems</p> <p>Heating and ventilation system (ML 0436)</p> <p>Fire protection (ML 0426)</p> <p>Starting system</p>

Gas turbine – operation course– control room operator

Course description

This site-specific course is designed to enable, supervisors, operations, and maintenance personnel to operate Nexus Controls designed heavy-duty gas turbine generator units. The course develops a background in gas turbine generator support systems, and operations, which will enable participants to analyze operating problems and take the necessary corrective action. It will also detail the design and construction of the gas turbine generator. Emphasis is placed on the detailed description of the gas turbine – generator major components, the functions of their auxiliary systems, and the operator's responsibilities with regard to systems operations, and operational data acquisition, and evaluation of anomalies through the use of classroom instruction, class exercises, and use of a turbine – generator trainer. If the course is held at the customer's location it will include site visits to familiarize personnel with the physical layout of the gas turbine – generator, and the location of the various system components, and provide personnel the opportunity to correlate the system piping schematics to the respective system hardware. Operators are instructed in how to interpret fault annunciation and how to determine if the annunciated fault can be remedied by operator action or with the assistance of instrumentation and/or maintenance personnel. The course focuses on the starting, loading, and specific operator checks of the various turbine support and auxiliary systems to ensure reliable operation of the gas turbine – generator unit, and the effect that operation has on major mechanical maintenance.

Operations	Maintenance
GT01 Gas turbine – operations – field operator course (5 days)	GT03 Mark VI/e gas turbine control system operation and maintenance (10 days)
GT02 Gas turbine – operations – control room operator course (5 days)	AER01 Mark VI/e Nexus LM aeroderivative maintenance and troubleshooting (10 days)
ST01 Steam turbine – operations (5 days)	

Course code	GT02
Target audience	Operations
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction Customer specific unit orientation Gas turbine description and key documentation Operating sequences Screen navigation and familiarization Startup Loading	On-line water wash Shutdown Cooldown Off-line water wash	Protective functions Pre-ignition trips Post-ignition trips Overspeed protection Overspeed tests	Control system overview Layout and architecture Networks Control system ToolboxST basics Modifying or forcing live values Alarm troubleshooting WorkstationST alarm viewer Alarm help	Alarm tracing Data collection Trending Viewing trip logs

Mark VI/e gas turbine control system operation and maintenance

Course description

This program is intended for all control technicians and engineers. The training will offer the attendees in-depth knowledge to work with the MK VI/e control system in application with the gas turbine. This training will familiarize them with the hardware and software components of the control system. It will develop strong skills in process alarm troubleshooting and analysis of the control code. Additional training includes LVDT calibration, control interface (Cimplicity HMI) software programming, sequence editing and diagnostic alarm troubleshooting.

Please note: The training equipment (trainer) will not run the site software. It will operate on generic, machine-compatible software (i.e. if the site training is for a steam turbine, the trainer will operate using a

'generic' steam turbine). If the site software is available at the time of the training, it will be used to illustrate various aspects of the training material, but it will not be loaded on the trainer.

Course code	GT03
Target audience	Maintenance
Duration (days)	10
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
<p>General descriptions</p> <p>GT operating principles</p> <p>GT main components overview</p> <p>Job documentation description</p> <p>Control systems introduction:</p> <p>Layout and architecture</p> <p>Networks description</p> <p>Redundancy options</p> <p>Input and output processing</p>	<p>Control systems description</p> <p>Power distribution modules</p> <p>Controllers</p> <p>I/O modules</p> <p>Protection modules and functions</p>	<p>Toolbox</p> <p>DDRs description</p> <p>Capture blocks description</p> <p>TripLog analysis</p>	<p>CIMPLICITY</p> <p>Workbench introduction</p> <p>Screens navigation and commands</p> <p>Alarm viewer module</p> <p>Instruments connection and configuration</p>	<p>Gas turbine auxiliary systems</p> <p>Describe and analyze the GT auxiliary systems</p> <p>Startup permissive and operation:</p> <p>Permissive to start analysis</p> <p>Startup sequence description</p> <p>Shutdown sequence</p> <p>Loading/unloading</p> <p>GT startup simulation</p>
Day 6	Day 7	Day 8	Day 9	Day 10
<p>GT protection sequences</p> <p>Fuel controls</p> <p>Combustion monitor</p> <p>Overspeed protection</p> <p>Vibrations protection</p> <p>Wheelspace protection</p> <p>Overtemperature protection</p>	<p>HMI practice</p> <p>Basic toolbox software modification</p> <p>Add new variables</p> <p>Create new sequences</p> <p>Basic graphic pages modifications</p> <p>Add new objects</p> <p>Create object animations</p> <p>Signals connection and configuration</p>	<p>Maintenance and troubleshooting</p> <p>Interaction among instruments, sequences and graphic pages</p> <p>Hardware and software investigation</p> <p>Diagnostic alarms troubleshooting</p> <p>Controller software download</p> <p>Processor board backup and restore</p> <p>I/O cards and terminal boards replacement</p>	<p>Maintenance and troubleshooting</p> <p>Actuators calibration procedure</p> <p>Panel power distribution check</p> <p>Ground fault check</p> <p>Power distribution troubleshooting</p>	<p>HMI / MK VIe file structure</p> <p>HMI screens view/edit features</p> <p>Course recap</p> <p>Open Q&A session</p>

MK Vie–Nexus Controls LM aeroderivative maintenance and troubleshooting

Course description

This program is intended for all control technicians and engineers, it introduces LM maintenance and alarm troubleshooting procedures of the Mark Vie control system. This course will also cover functional sensor and actuator description, troubleshooting, and a summary of calibration and inspections required for major turbine package.

The course designed primarily for LMS100, LM6000 Mark Vie applications. The course material and exercises provide training on hardware, network interfaces and software tools which are used to troubleshoot alarms, edit the control logic, configure the inputs and outputs (both hardwired and networked), and calibrate Servo-actuated valve LVDT's and other devices. It covers also, ToolBoxST, WorkStationST and Cimplicity/HMI. The course DOES NOT include repair procedures for gas turbine components.

Please note: The training equipment (trainer) will not run the site software. It will operate on generic, machine compatible

software (i.e. if the site training is for a steam turbine, the trainer will operate using a 'generic' steam turbine). If the site software is available at the time of the training, it will be used to illustrate various aspects of the training material but it will not be loaded on the trainer.

Course code	AER01
Target audience	Engineering
Duration (days)	10
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

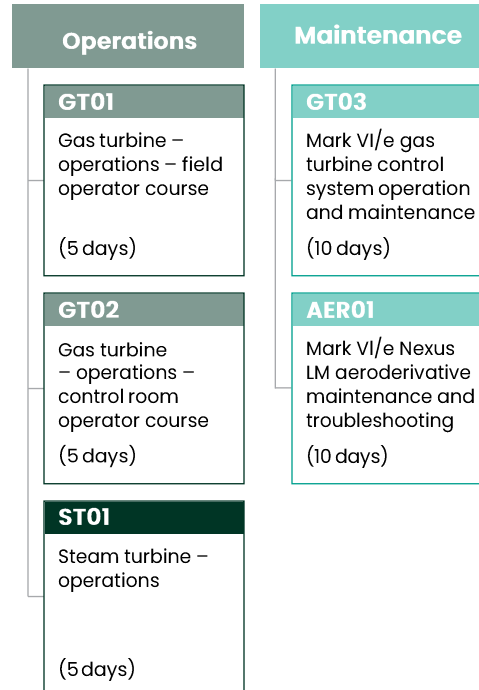
Day 1	Day 2	Day 3	Day 4	Day 5
Control system configuration and troubleshooting Mark Vie overview and system architecture Mark Vie communication networks Operator interface familiarization ToolBoxST and Mark Vie system file basics	Hardware and I/O configuration I/O packs and terminal boards Controllers and power supplies Configuring digital I/O Configuring analog I/O Hardware and I/O troubleshooting	Troubleshooting alarmsshutdowns Mark Vie software familiarization Variables and constants Tracing signals w/ using Toolbox ST finder Viewing and collecting data using watch windows and trend recorder Basic troubleshooting of alarms and other fault conditions	Working with data and alarms on the operatorinterface HMI documentation and files Operating and navigating HMI screens Graphical screen trends WorkStationST data collection and alarm history	Basic adjustments Adding alarms, events and SOE's Adjusting constants and tables Servo LVDT calibration Making changes permanent
Day 6	Day 7	Day 8	Day 9	Day 10
Mark Vie network configuration and troubleshooting Mark Vie networks Peer-to-peer communications Using the system database for peer-to-peer coms Troubleshooting common communications issues Basic troubleshooting of alarms and other fault conditions	WorkStationST alarms, data captures, data captures and Trip logs WorkStationST overview and tools Viewing alarms using alarm viewer Configuring alarm history and trip logs	Configuring trend recorder, capture blocksand DDR's Advanced system level troubleshooting Advanced troubleshooting ToolBoxST tools Troubleshooting of I/O faults	Advanced hardware troubleshooting Hardware diagnostics and troubleshooting Hardware replacement	I/O pack initializationUCCX controller initialization Unit specific documentations review Course recap and open Q&A session

Steam turbine – operation course

Course description

This site-specific course is designed to enable, supervisors, operations, and maintenance personnel to operate heavy-duty steam turbine generator units. The course develops a background in steam turbine generator support systems, and operations, which will enable participants to analyze operating problems and take the necessary corrective action. It will also detail the design and construction of the ST GEN. Emphasis is placed on the detailed description of ST GEN major components, the functions of their auxiliary systems, and the operator's responsibilities with regard to systems operations, and operational data acquisition, and evaluation of anomalies through the use of classroom instruction, class exercises, If the course is held at the customer's location it will include site visits to familiarize personnel with the physical layout of ST GEN and the location of the various system .

Course code	ST01
Target audience	Operations
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

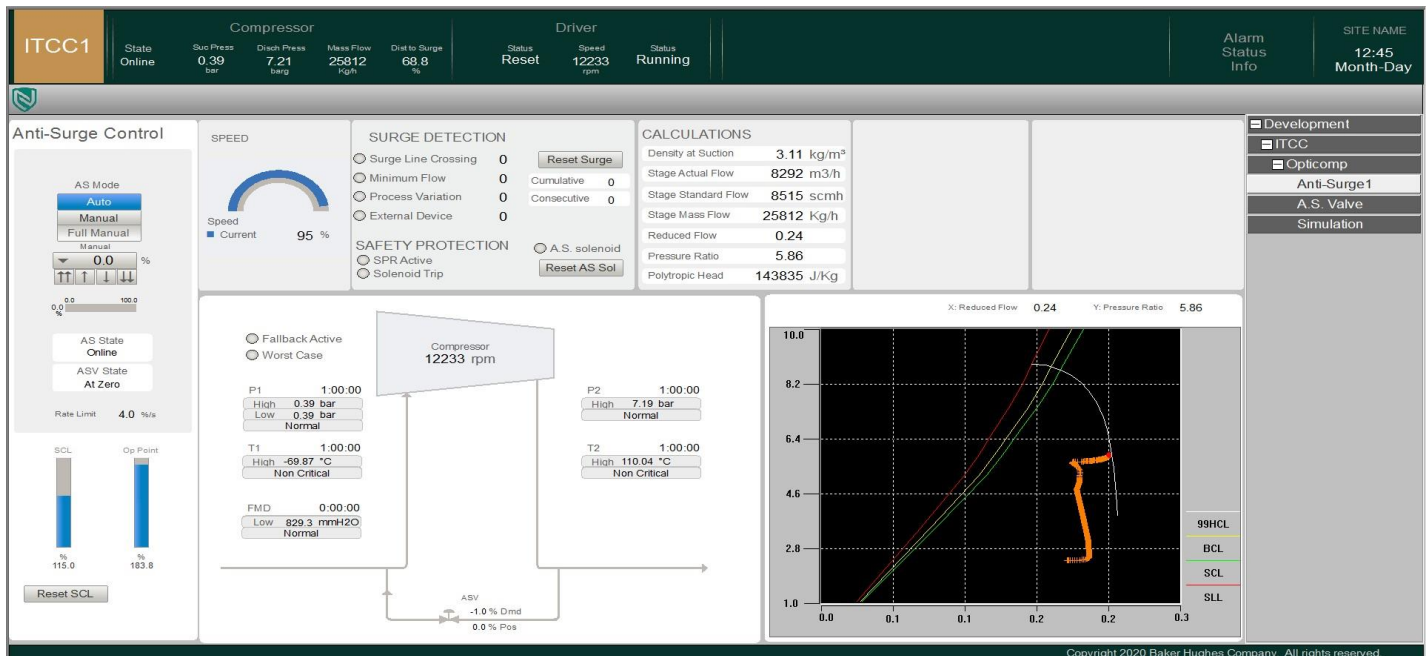


Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Steam turbine basics Types of steam turbines Major components Reheat turbines HP/IP/LP turbines Turbine steam Flow Main stop valves Intercept valves Reheat valves Extraction valves	Protection and monitoring Over-temperature protection and monitoring Exhaust pressure protection Water induction detection Axial position and clearance protection Bearing vibration protection Low lube oil pressure protection Low hydraulic oil pressure protection Windage heating protection Overspeed protection	Oil systems and phases of operation Lube oil system Hydraulic oil system Turning gear Startup and loading Pre-roll conditions and checks Permissives and holds Roll to turbine rated speed Synchronization Loading Maneuvering Normal shutdown Emergency shutdown	Control loops and limiters Speed/load control Inlet pressure control Lube oil temperature control Flow transfer mode control Pressure and temperature reference Steam seal pressure control Exhaust spray control Valve position limiter Pressure limiting Thrust limiter	Functional tests Primary overspeed trip test Emergency overspeed trip test Electrical trip device (ETD) test Stop valve tests AC lube and hydraulic pump motor tests DC emergency bearing oil pump test DC emergency seal oil pump test (if applicable)

Compressor controls courses

Operations	Maintenance
CCS01 MKVie compressor controls (anti-surge) operator course (3 days)	CCS02 MKVie with integrated turbine and compressor controls (ITCC) maintenance course (5 days)
CCS03 OnCore with Integrated Turbine & Compressor Controls (ITCC) operator course (3 days)	CCS04 OnCore with Integrated Turbine & Compressor Controls (ITCC) maintenance course (5 days)



MKVle compressor controls (anti-surge) operator course

Course description

Integrated turbine and compressor control (ITCC) training course intended to provide operations team an overview of compressor surge protection and implementation on HMI screens.

Course code	CCS01
Target audience	Operations
Duration (days)	3
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Operations	Maintenance
CCS01 MKVle compressor controls (anti-surge) operator course (3 days)	CCS02 MKVle with integrated turbine and compressor controls (ITCC) maintenance course (5 days)
CCS03 OnCore with Integrated Turbine & Compressor Controls (ITCC) Operator Course (3 days)	CCS04 OnCore with Integrated Turbine & Compressor Controls (ITCC) maintenance course (5 days)

Course content and agenda

Day 1	Day 2	Day 3
System overview and architecture Cimplicity Startup and navigation Workstation ST alarm viewer basics Various compressor auxiliaries Basics of valve sequence PID basics and relation to the antisurge control Compressor maps and antisurge calculation	Antisurge main PI loop Antisurge DTC Antisurge rate controller Antisurge decoupling Antisurge fallback strategy features Surge exploration or, line verification procedure Surge detection and counters	Load and master control Load sharing Cimplicity trends Trip log trender

Mark VIe with Integrated Turbine and Compressor Controls (ITCC) maintenance

Course description

This program is intended for personnel whose site has a Mark VIe control with ITCC.

The training will familiarize students with the hardware and software components and provide fundamental knowledge to troubleshoot and maintain the associated equipment.

The course is modular and includes training material derived from actual installed Mark VIe control systems. Training is performed with short lessons followed by labs. The hands-on labs are performed on an HMI computer specially programmed to simulate a turbine-compressor set. The labs are progressively challenging and assist the students in learning the basic skills including alarm and system troubleshooting.

This course will provide basic knowledge on the following:

- Understand the hardware architecture of the Mark VIe control
- Become familiar with the software applications used for monitoring and configuring the Mark VIe control
- Use the tools available to maintain the turbine-compressor set and the control system itself
- Learn the techniques for tracing alarm messages to their sources
- Become familiar with the documents, drawings, and publications required to effectively maintain the equipment and how to access them
- Understand the phenomenon of compressor surge

Operations	Maintenance
CCS01 MKVIe compressor controls (anti-surge) operator course (3 days)	CCS02 MKVIe with integrated turbine and compressor controls (ITCC) maintenance course (5 days)
CCS03 OnCore with Integrated Turbine & Compressor Controls (ITCC) Operator Course (3 days)	CCS04 OnCore with Integrated Turbine & Compressor Controls (ITCC) maintenance course (5 days)

- Learn the fundamentals of the compressor control functions of the controller software

Course code	CCS02
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
CIMPLICITY startup / navigation Nexus Controls control system solutions (ToolBoxST) application and file basics Monitoring of I/O and software Practical lab(s)	Nexus Controls control system solutions (ToolBoxST) application and file basics Finder Trend recorder Signal browser Variables and control constants Program blocks Watch windows Practical lab(s)	Troubleshooting alarms Troubleshooting CIMPLICITY™ displays Trip log Practical lab(s) Documentation and drawings Web documents Replacing I/O boards	Replacing the controller Basics of valve sequence PID basics and relation to the antisurge control Compressor maps and antisurge calculation Antisurge main PI loop	Antisurge various subfeatures (e.g. DTC, rate, decoupling) Antisurge fallback strategy features Surge exploration or, line verification procedure Surge detection and counters Load and master control Load sharing Documentation and drawings Web documents Replacing I/O boards

OnCore with Integrated Turbine and Compressor Controls (ITCC) operator course

Course description

- Integrated Turbine and Compressor Control (ITCC)
Training course intended to provide operations team an overview of compressor surge protection and implementation on HMI screens.

Course code	CCS03
Target audience	Operations
Duration (days)	3
Training location	<ul style="list-style-type: none"> BH training facility Customer site Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Operations	Maintenanc
<p>CCS01</p> <p>MKVle compressor controls (anti-surge) operator course</p> <p>(3 days)</p>	<p>CCS02</p> <p>MKVle with integrated turbine and compressor controls (ITCC) maintenance course</p> <p>(5 days)</p>
<p>CCS03</p> <p>OnCore with Integrated Turbine & Compressor Controls (ITCC) Operator Course</p> <p>(3 days)</p>	<p>CCS04</p> <p>OnCore with Integrated Turbine & Compressor Controls (ITCC) maintenance course</p> <p>(5 days)</p>

Course content and agenda

Day 1	Day 2	Day 3
<p>System overview and architecture</p> <p>Figview startup and navigation</p> <p>AlmList & AlmHist basics</p> <p>Various compressor auxiliaries</p>	<p>Basics of valve sequence</p> <p>PID basics and relation to the Antisurge control</p> <p>Compressor maps and Antisurge calculation</p> <p>Antisurge main PI loop</p> <p>Boost control actions</p> <p>Antisurge rate controller</p> <p>Antisurge decoupling</p> <p>P1 & P2 limiter controls</p> <p>Antisurge fallback strategy</p>	<p>Surge line verification and exploration objectives</p> <p>Surge detection methods and counters</p> <p>Load and master control</p> <p>Load limiter controls</p> <p>Load sharing</p> <p>OptimumC trends</p> <p>Trip log event review</p>

OnCore with Integrated Turbine and Compressor Controls (ITCC) maintenance

Course description

This program is intended for personnel whose site has a Nexus OnCore control with ITCC.

The training will familiarize students with the hardware and software components and provide fundamental knowledge to troubleshoot and maintain the associated equipment.

The course is modular and includes training material derived from actual Installed OnCore control systems. Training is performed with short lessons followed by labs. The hands-on labs are performed on an HMI computer specially programmed to simulate a turbine-compressor set. The labs are progressively challenging and assist the students in learning the basic skills including alarm and system troubleshooting.

This course will provide basic knowledge on the following:

- Understand the hardware architecture of the OnCore control
- Become familiar with the software applications used for monitoring and configuring the OnCore control
- Use the tools available to maintain the turbine-compressor set and the control system itself
- Learn the techniques for tracing Alarm messages to their sources
- Become familiar with the documents, drawings, and publications required to effectively maintain the equipment and how to access them
- Understand the phenomenon of compressor surge
- Learn the fundamentals of the compressor control functions of the controller software

Operations	Maintenance
CCS01 MKVIe compressor controls (anti-surge) operator course (3 days)	CCS02 MKVIe with integrated turbine and compressor controls (ITCC) maintenance course (5 days)
CCS03 OnCore with Integrated Turbine & Compressor Controls (ITCC) Operator Course (3 days)	CCS04 OnCore with Integrated Turbine & Compressor Controls (ITCC) maintenance course (5 days)

Course code	CCS04
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
FigView startup/navigation OptimumC software basics	Practical lab(s) Nexus OnCore hardware System configuration HMI configuration	Arithmetic configuration Function blocks Figure making Real time and historical data bases	Various compressor auxiliaries & valve sequences Compressor maps and antisurge calculation Antisurge main PI loop Boost control actions Antisurge rate controller Antisurge decoupling PI & P2 limiter controls Antisurge fallback strategy	Surge line verification and exploration objectives Surge detection methods and counters Load and master control Load limiter controls Load sharing OptimumC trends Trip log event review

HMI and network courses

Maintenance

HMI01

HMI upgrade
maintenance
course

(3 days)

HMI02

Network upgrade
introduction
course

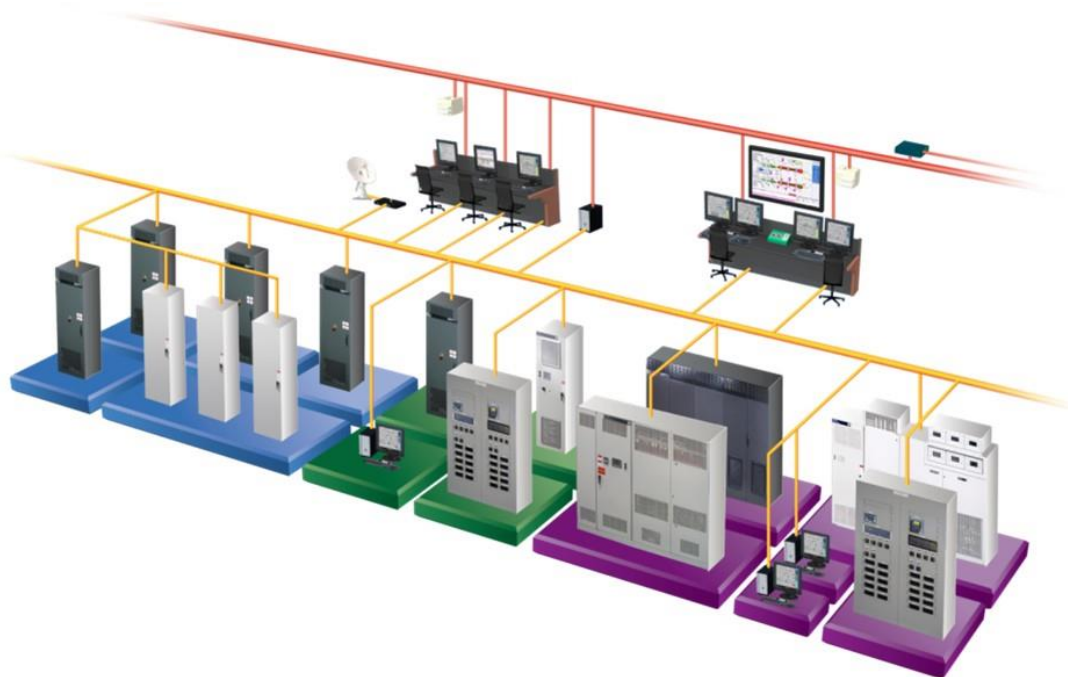
(4 days)

Engineering

NW01

Network
maintenance and
troubleshooting
(intermediate)

(5 days)

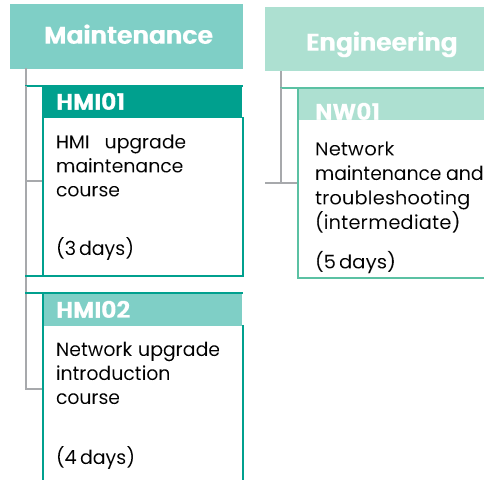


HMI upgrade maintenance course

Course description

This course is intended for customers with MKVIe-HMI upgrade projects. It provides the maintenance team with the required knowledge to use new HMI software and features.

Course code	HMI01
Target audience	Maintenance
Duration (days)	3
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3
Cimplicity training Cimplicity startup and navigation lab #1 GT startup and synchronization lab #2 WorkstationST alarm viewer basics lab #3 ToolboxST basics	Workstation ST basics Trender files training Trender lab #4 Alarm tracing lab #6 Troubleshooting Cimplicity screens lab #7 Viewing trip log data	Cimplicity advance training Cimplicity communications Cimplicity screen editing lab #8 Adding Cimplicity screen navigation lab #9 HMI backup

Network upgrade introduction course

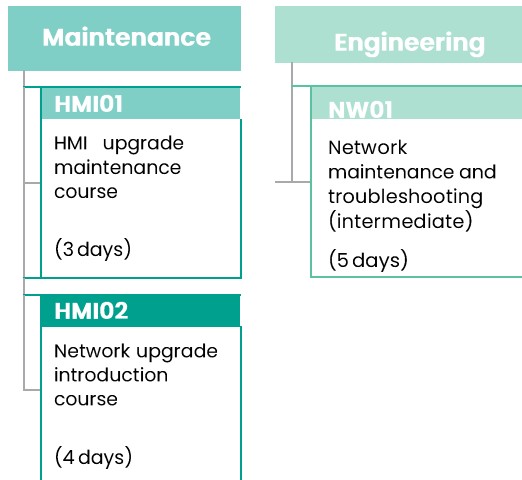
Course description

This course provides fundamental maintenance and troubleshooting skills for typical MK Vle control system maintenance team. It assumes that site network is running WorkStationST (If otherwise, please highlight).

Typical Mark-Vle network composes of multi-layer; UDH (unit data highway), PDH (plant data highway), ADH and others (based on site layout and configurations) in addition to that IONet (I/O network) is also covered within this course. This course covers UDH and PDH networks in details. With advanced Cimplicity fundamentals topics.

Site specific network topology drawing (MLI 4108) will be used as a reference during this course.

Course code	HMI02
Target audience	Maintenance and engineering
Duration (days)	4
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3	Day 4
Introduction to networking Instructors background Networking architecture Network 3.1 and network 4.0 TCP/IP addressing TCP/IP protocol IPV4 addressing and subnetting	Switches and routing Routing static Access control list Cisco switches introduction Switch configuration Workshop 1, switch configurations	Network troubleshooting and event recovery Troubleshooting tools Communication failures Acronis backup and recovery Workshop 2, backup and recovery plans	Cimplicity fundamentals Cimplicity communication Cimplicity screen editing Adding Cimplicity screen navigation

Network maintenance and troubleshooting (intermediate)

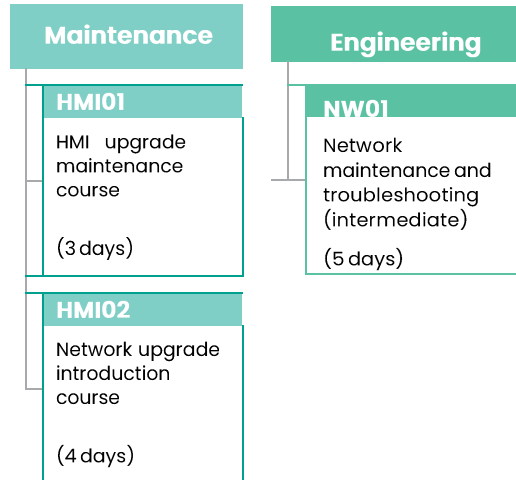
Course description

This course provides combination of technical classroom presentation and hands on workshops along with basic functions of networking systems.

Discover the theory and main basic functions of networking systems.

Learn how to manage and troubleshoot network.

Course code	NW01
Target audience	Maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Training laptops with generic simulated software and graphics



Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction to networking Instructors background Intro to OSI model Network types and config Data transmission Media: copper, fiber, noise Wireless networking devices	Networks and hardware Topologies Logical and Ethernet networks VLANS TCPIP addressing TCPIP protocol IPV4 and IP and IPV6 addressing Delivery	Routers Static routing Dynamic routing Assigning IP addresses DNS (domain name services) Command and utilities WANS	Network management Network monitoring Configuration documentation Network performance Network security Vulnerabilities Threats Authentication Encryption	Network troubleshooting Troubleshooting models Troubleshooting utilities Hardware troubleshooting tools Common issues Security configuration issues Troubleshooting security issues

Cyber Security/Nexus OTArmor courses

Maintenance

CAP01

Nexus Controls
CAP training

(2 days)

SEC01

Nexus OTArmor
CSMS introduction

(3 days)

SEC02

Nexus
OTArmor CSMS
intermediate

(5 days)

Engineering

SEC03

Nexus OTArmor
advanced
training

(7 days)



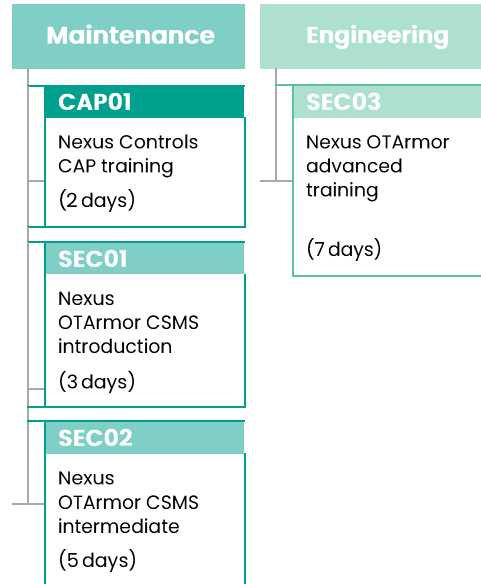
Nexus Controls Cyber Asset Protection (CAP) training

Course description

This session has combination of technical classroom presentation and hands on workshops

It enables site personnel to perform cyber asset protection (CAP) updates and troubleshooting

Course code	CAP01
Target audience	IT/OT/maintenance
Duration (days)	2
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Onsite using customer installed Nexus OTArmor server and HMIs



Course content and agenda

Day 1	Day 2
<p>Introduction</p> <p>Instructors background Patch management Testing and validation process, high level</p>	<p>CAP patching and event recovery</p> <p>CAP patching instruction process Advanced CAP troubleshooting Recovery and backup Cyber portfolio introduction Cyber protection: Industry best practices</p>

Cybersecurity – Nexus OTArmor CSMS introduction

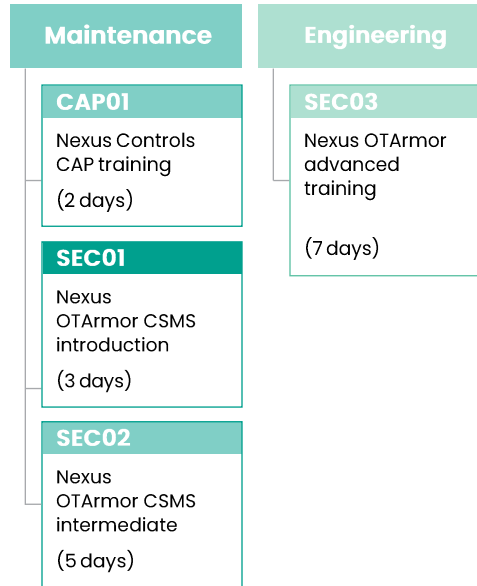
Course description

Nexus OTArmor is the latest release of the Nexus Controls cyber security management system (CSMS). This program is designed to introduce students to the latest virtual machines, applications and concepts related to the Nexus OTArmor CSMS.

Objectives:

- Combination of technical classroom presentation and hands on workshops.
- Understand basic concepts of cyber security and cyber security features.
- Enable personnel to perform routine activities including backup and recovery, updates, patch deployment and troubleshooting.
- Perform routine operations on the Nexus OTArmor system including how to log in, manage disaster recovery tasks, navigate virtual machines.
- Customization of the daily training plan with expert guidance on creation, content flow and workshops for hands-on learning.

Course code	SEC01
Target audience	IT/OT/maintenance
Duration (days)	3
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Onsite using customer installed Nexus OTArmor server and HMIs



Course content and agenda

Day 1	Day 2	Day 3
Instructor/s and student backgrounds Cyber security awareness Introduction to Nexus OTArmor CSMS	Virtual hosts Virtual machines Disaster recovery system	Patch management Site protection

Cybersecurity – Nexus OTArmor CSMS intermediate

Course description

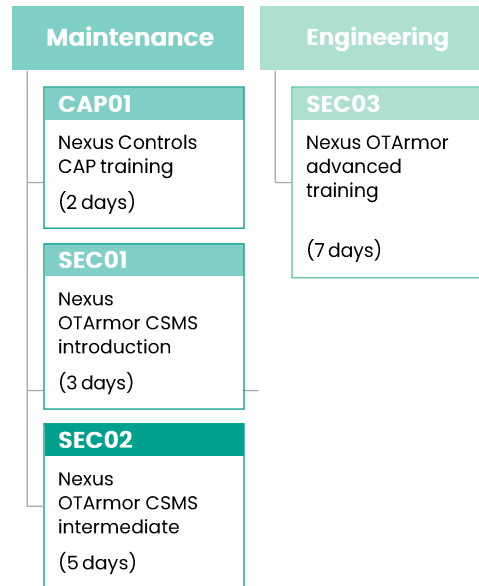
Nexus OTArmor is the latest release of the Nexus Controls Cyber Security management system (CSMS). This program is designed to introduce students to more advanced operations tasks related to the latest virtual machines, applications and concepts related to the Nexus OTArmor CSMS.

Objectives:

- Combination of technical classroom presentation and hands-on workshops.
- Understand and demonstrate basic and advanced functions of cyber Security using the Nexus OTArmor CSMS product.
- Enable personnel to perform monthly patching activities including updates, patch deployment and troubleshooting.
- Perform routine operations on the Nexus OTArmor CSMS system including how to log in, manage disaster recovery tasks, navigate virtual machines.
- Customization of the daily training plan with expert guidance on creation, content flow and workshops for hands-on learning.
- Includes simulators, customer software, and laptop equipment labs and simulation.

Program and content:

The program is a five day, interactive training program giving students the ability to learn and demonstrate key skills required to effectively manage their cyber security system. With core content building the basis for the material, optional content is added based on customer configuration.



Course code	SEC02
Target audience	IT/OT/maintenance
Duration (days)	5
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	Onsite using customer installed Nexus OTArmor server and HMIs

Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5
Introduction to OTARMOR Virtual Hosts	Virtual Machines Workshop 1: Virtual machine navigation Domin controllers Workshop 2: DC1/DC2 Workshop 3: Domain policies	DR1 disaster recovery Workshop 4: DR1	PMI patch management Two factor authentication *Certificate authority *SIEM (SPLUNK)	*McAfee ani virus *McAfee whitelisting *Symantec anti-virus *Trend micro anti-virus *XONA

*Optional Content

*2 SIEM (SPLUNK)

*4 McAfee Whitelisting

*5 Trend Micro Anti-Virus

*1 Certificate Authority

*3 McAfee Anti Virus

*4 Symantec Anti-Virus

*5 XONA

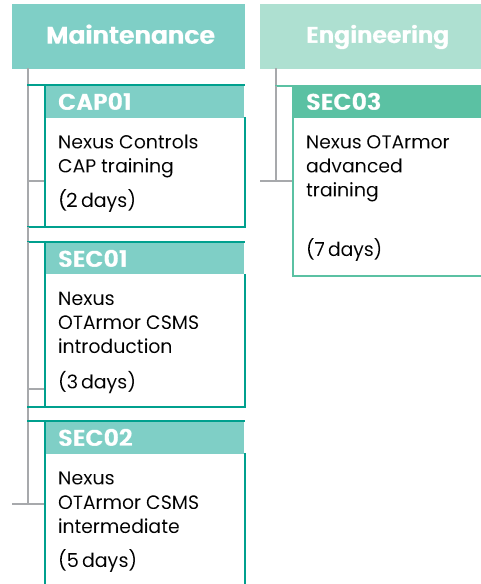
Cybersecurity – Nexus OTArmor advanced

Course description

This session has combination of technical classroom presentation and hands on workshops

It's built for generic-industrial cyber security knowledge targeting technical (IT/OT) teams.

Course code	SEC03
Target audience	Engineering
Duration (days)	7
Training location	<ul style="list-style-type: none"> • BH training facility • Customer site • Remote training
Simulation tools and labs	<ul style="list-style-type: none"> • Onsite: using customer installed Nexus OTArmor server and HMIs • Offsite: using actual training Nexus OTArmor server



Course content and agenda

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Introduction to cyber security	Basics of computer science (NAT, VLAN, SPI, DP) Basics of power shell scripting	Designing Microsoft active directory group policy objects	Understanding McAfee ePO modules Application control and DLP functionality	Designing firewall policies and introduction to Fortinet CLI Designing splunk dashboards, alerts and reports	Introduction to cyber security troubleshooting	Assessment exam Course recap and open Q&A session

Woodward courses



Woodward introduction training

Course description

This session will familiarize operator teams with Woodward controls, main components and associated systems and devices.

Learn with on-site equipment.

Course code	WW01
Target audience	Operations
Duration (days)	2
Training location	<ul style="list-style-type: none">• BH training facility• Customer site• Remote training
Simulation tools and labs	Onsite: using customer installed system

Course content and agenda

Day 1	Day 2
System overview and architecture <ul style="list-style-type: none">• Woodward system overview• Software overview, GAP and control assistant• Wiring and elementary prints and I/O logic• Equipment walk down	WorkStationST alarm viewer basics <ul style="list-style-type: none">• System calibration review• Troubleshooting, standard steps and process Optional additional topics: <ul style="list-style-type: none">• Fanuc or PLC or Quick panel software• Alarm tracing review• Alarm designations and trip screens Methodology: <ul style="list-style-type: none">• Classroom learning by presentation slides.• Reference of manuals and plant specific documentations.• Equipment walk-down, and question and answer session

Baker Hughes Nexus Controls Remote Learning Flyer

Live instructor led sessions

Remote Learning

Remote training service connects your staff with our industry leading instructors without the need for expensive travel. Gain remote access to our virtual classroom in our instructor led skill development courses.



Operation, maintenance and unit control

With years of field experience, Nexus Controls trainers have a deep knowledge of product operation, maintenance, and control. Through a secure web connection, instructors and participants collaborate in the same virtual classroom, preserving traditional classroom learning outcomes.



Remote hands-on workshop

Remote workshops on daily operations and real case scenarios are conducted on live simulators. Practice is supervised by instructors and virtual class sizes are kept small, ensuring you get the most out of your training experience.



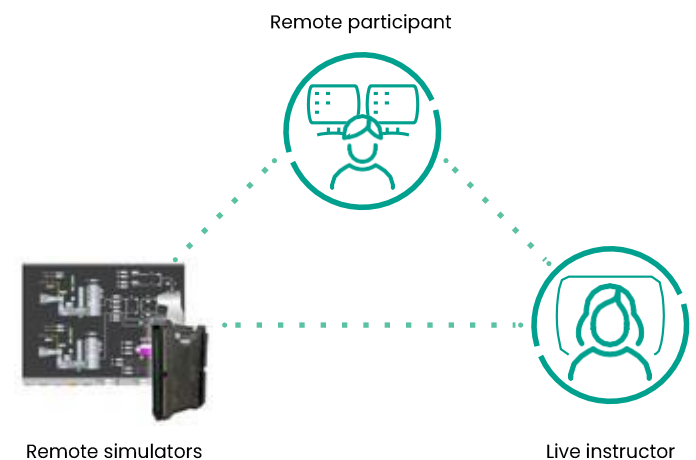
Effective skill development

With 14 modules, you will find courses tailored to your team's experience level, whether operators, technicians, or engineers. Our remote training is simple to use, providing you access to technical and operational knowledge, saving you on travel expenses.

Objectives and benefits

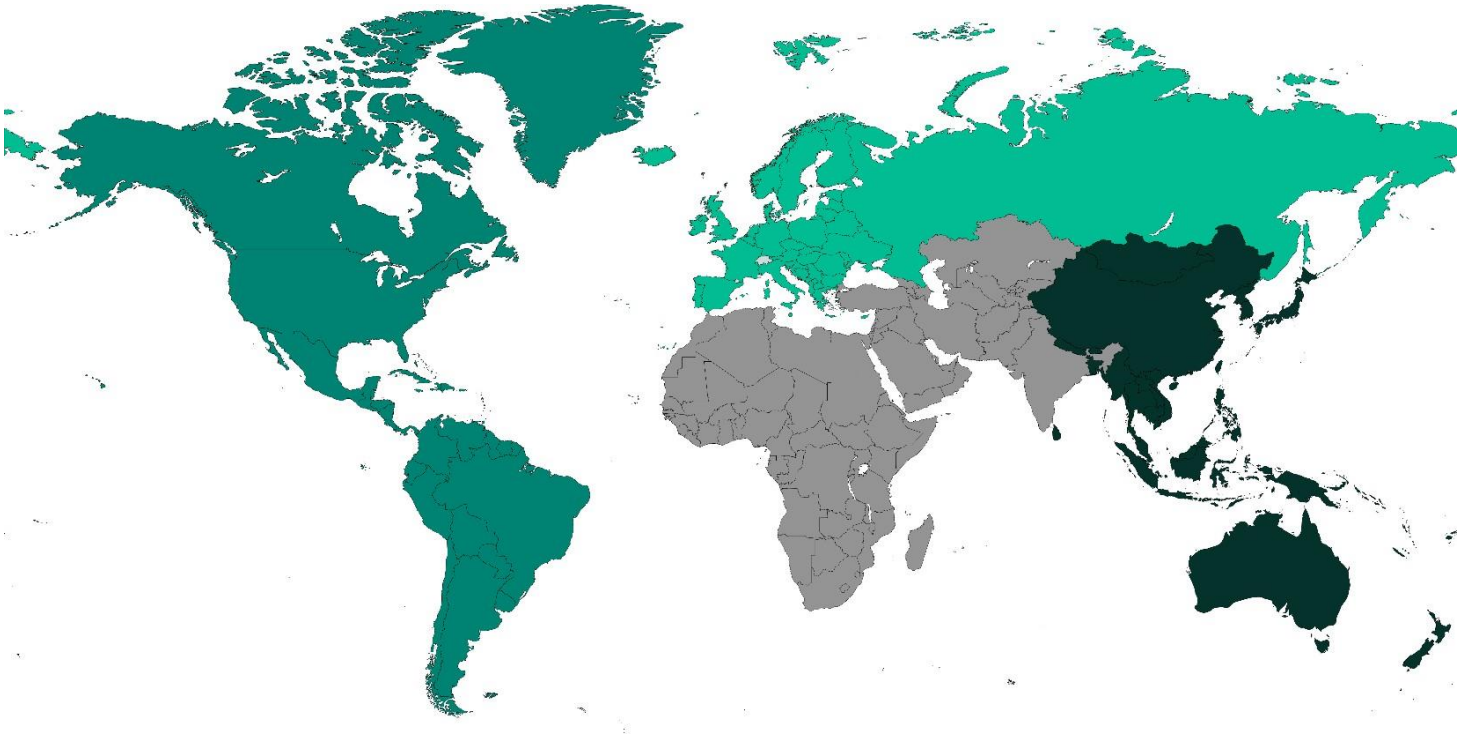
- Improved technical skills to protect and control assets
- Customer specific software and break-fix workshops
- Secure remote connection on hosted training simulators
- Site specific Q&A sessions and coaching
- Develop skills for operators, maintenance, and master technicians
- Reduction in equipment downtime with a well-trained staff

Global expertise delivered locally with secured remote connection



Remote student recommendations: computer with mouse and keyboard, two monitor setup, audio headset, internet connection of 25mbps.

For general inquiries, quotes, or additional information, please email the appropriate contact for your region.



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