CNC Power Engineering Always on the move









CNC and Drives Training catalogue 2021



www.num.com



Who besides you has the best expertise in your area of business?

The answer is obvious and quite simple: you are the expert in your field. Similarly, no one other than NUM could claim to have the deepest expertise of our extended range of drives and CNCs. After all, this has been our business for fifty years. This is why we are your number one partner for the training of your teams.

Whether you are a User, an OEM, a Maintenance specialist or a System builder, NUM has in its catalog all kind of training sessions dedicated to your applications and this for all generation of NUM products making parts on today machines.

Of course each customer has its own requirements, each machine and each application has its own specificities, and this is why we can also offer customized training sessions focused on your particular needs.

As a provider of CNC High End Applications, we have organized our training sessions by features and level of knowledge required, in order to help you to get all the data you need and only the data you need to be the most efficient. These sessions are conducted by training specialists and applications engineers so you can be assured that you will always get the most accurate and professional answers, whatever your question or concern might be. These sessions will give a chance to develop a durable relationship between our companies to further develop cooperation for the full benefit of all.



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Training with NUM: your advantages

- Technical data are up to date
- Should you need a specific function, you will get in depth information
- Partnership development
- You will be in touch with the experts in every domain of NUM activity
- Whatever your area of expertise might be (Maintenance, Service, Programming, Setup...), you will find the courses you need
- Full range of products and software in one location

Training Centres

All NUM technical centres are equipped to provide training. These sessions will either take place in our premises or in your facility.





Training Courses

The different training modules are linked in a way to provide a logical path for mastering our application solutions in your area of expertise.

	FX	TR	3	0	1
Control Series					
Generic	FX				
Flexium only	FL				
Flexium ⁺ only	FP				
Training					
Туре					
Product Knowledge			1		
Operation and Diagnostics			2		
Maintenance			3		
Engineering and Integration			4		
Modifier					
Expertice Level					
Beginner					1
Advanced					2
Specialist					3

Generic Training Sessions

FXTR 101	Flexium system description
FXTR 102	Flexium and Safety
FXTR 201	Operation and basic maintenance
FXTR 202	Advanced part programming
FXTR 213	Flexium 3D
FXTR 223	Dynamic operators in C
FXTR 233	High speed cutting – 5 axes functions
FXTR 301	Flexium system maintenance
FXTR 401	Flexium system initial setup
FXTR 423	NUMDrive C on CANOpen
FXTR 433	Extended NCK Access (ENA)
FXTR 443	Flexium HMI personalization
FXTR 453	Communication with Flexium



Flexium-Specific Training Sessions

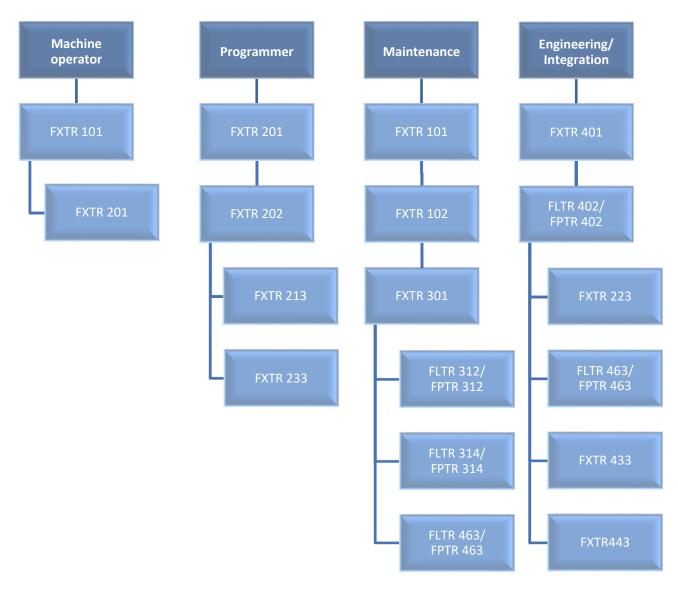
FLTR 312	Flexium advanced maintenance
FLTR 314	NUMDrive C advanced maintenance
FLTR 402	Flexium system advanced setup
FLTR 463	Safety including SAM

Flexium+-Specific Training Sessions

FPTR 312	Flexium ⁺ system advanced maintenance
FPTR 314	NUMDrive X advanced maintenance
FPTR 402	Flexium ⁺ system advanced setup
FPTR 463	Safety including NUM-SAMX



Proposed Training Paths





Your Training Contacts

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Training Organization

Quotation

Offers can be asked at your training contacts (see section 'Your Training Contacts').

Date and time table

Training dates and time tables will be part of a quotation.

Journey

Your local sales representative of NUM will provide you with journey information.

Hotels

Your local sales representative of NUM can recommend you hotels near to the training places.

Flexium system description



Your area of interest	Prerequisite
General knowledge	None
Objectives	Supports
 Understanding the Flexium range structure (CNCs and Drives) 	 Training materials Individual components Simulator
✓ Understanding the main functions	Deliveries
 Ability to define a configuration with the Flexium catalogue 	 Deliveries Course presentation (printed and .pdf on CD) Flexium catalogue (on CD)
Training Content	
 Flexium CNC presentation The different models of CNCs Hardware structure – Software functions 	 NUMDrive X presentation Hardware structure Drives functions and performances Axes and spindle motors
The panels	
 PC Panels Machine panels 	Tools PLC programming Web tools
 The PLC Structure Programming languages IOs 	 Applications From the single unit CNC to the multi CNC - multi panels configurations
 NUMDrive C presentation Hardware structure Drives functions and performances Axes and spindle motors 	Questions and answers (1/2 hour)

Duration

1 day

Date / Costs

Flexium and Safety



Your area of interest	Prerequisite
General knowledge	None
Objectives	Supports
 Understanding the Flexium and Flexium⁺ safety concepts 	Training materials Individual components Simulator
 Understanding the various safety features 	Deliveries
 Ability to define the components and development required for a particular configuration 	 Course presentation (printed and .pdf on CD) Flexium catalogue (on CD)
Training Content	
Safety: What is it? • Safety PLCs • Safe motions • Safety level	 Safety and Motions SAM, STO and NUMDrive C SAMX, STOX and NUMDrive X
General on EtherCAT and FSoE	Questions and answers (1/2 hour)
 The Safe PLC Structure Programming languages I/Os 	
Duration	Date / Costs
1 day	Please consult your local training contact

Operation and basic maintenance



Your area of interest

Machine operator – 1st level maintenance

Objectives

- Ability to run a machine equipped with Flexium system
- Understanding and adjusting the coordinate systems and tools offsets
- Understanding operators message and status indicators to perform a first level maintenance

Training Content

Operation

- o Using the HMI
- Modes of operation
- ISO concepts (interpolation feedrate tools offsets main canned cycles)
- Coordinate systems programmable axes
- Work preparation, tools offsets, origin presets
- Basic of parametric programming

Maintenance

- Status indicators
- Operators messages
- LED indications
- Backup of essential data
- Adding a system option

Duration

3 days

Prerequisite

Knowledge of NUM products or FXTR 101

Supports

- Training materials
- o Individual components
- Simulator

Deliveries

- Course presentation (printed and .pdf on CD)
- Programming manual (CD)
- Tools
- \circ Web tools
- Flexium license loader

Questions and answers (2 hours)

Date / Costs

Advanced part programming

	lications
FXTR	202

Your area of interest	Prerequisite
Advanced part programming – custom macros – special functions for OEM	Level FXTR 201
Objectives	Supports
 Mastering the advanced ISO functions of the system Ability to create a custom macro (tool 	Training materials Individual components Simulator
changer – milling head exchange – probing etc.)	 Deliveries Course presentation (printed and .pdf on CD) Programming and advanced programming manual (CD)
Training Content	

Advanced ISO functions

- Polar programming
- Probing management
- Pocket cycles
- Complements on parametric programming
 - Detailed information on E parameters
 - Relation with the outside via the PLC
- Structured programming
- Dynamic operators
- Customized G codes

Exercises

Questions and answers

Duration

4 days

Date / Costs

Flexium 3D



Your area of interest	Prerequisite
Machine operation - Programming	Knowledge of NUM products or FXTR 201
Objectives	Supports
 Using Flexium 3D to validate a part program Interacting with Flexium HMI to correct possible programming faults 	Training materials ○ Simulator Deliveries
 Optional : Customizing Flexium 3D for machine simulation 	 Course presentation (printed and .pdf on CD)
Training Content	
 Flexium 3D presentation Principle of operation The different screens 	
 Running Flexium 3D Program configuration Defining the blank and the tools Off line and On line simulation 	
Exercises	
Optional o Designing a machine model	

Questions and answers (2 hours)

Duration

1 day + 1 day optional

Date / Costs

Dynamic operators in C

FXTR 223

Your area of interest

General knowledge

Objectives

 Develop an application using dynamic operators in C

Prerequisite

FXTR 202 and C language

Supports

Training materials

- o Individual components
- o Simulator

Deliveries

- Course presentation (printed and .pdf on CD)
- Flexium catalogue (on CD)

Training Content

- Principle of dynamic operators
- Short example using classic dynamic operators
- o Review list of parameters
- The compiler
- o Examples
- Trace and debug

Duration

1 day

Date / Costs

High Speed Cutting – 5 axes functions



Your area of interest	Prerequisite		
General knowledge	FXTR 202 and FXTR 401		
Objectives	Supports		
✓ Mastering 5 axes machining functions	Training materials		
✓ RTCP (Rotating Tool Centre Point)	 Individual components Simulator 		
✓ Inclined plane	Deliveries		
✓ High speed cutting	 Course presentation (printed and .pdf on CD) Flexium catalogue (on CD) 		
Training Content			
 NC 5 axes functions 	 Axes adjustments 		
\circ RTCP and inclined plane parameterization	 Flexium tools instruments 		
o Application	 Practical case 		
 High speed machining functions 	Questions and answers $(1/2 \text{ hour})$		
 Speed and acceleration controls 	Questions and answers (1/2 hour)		
 Optimization of parameters 			
Duration	Date / Costs		
2 days	Please consult your local training contact		

Flexium system maintenance

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Your area of interest

Maintenance

Objectives

 Ability to detect and replace defective components in a short time

✓ Predictive maintenance

Prerequisite

Level FXTR 101

Supports

Training materials o Simulator

Deliveries

Course presentation (printed and .pdf on CD)

Training Content

Flexium system maintenance

- o System structure
- o Components
- o System start up
- o Diagnostics
- o Software updates
- o Service tool
- o Safety
- o Part replacement

Drives maintenance

- o Product knowledge
- Drives exchange procedure

Questions and answers (1 hour)

Duration

3 days

Date / Costs



Flexium system advanced maintenance

CNC HighEnd Applications	
FLTR 31 2	2

Your area of interest	Prerequisite
Maintenance	Level FXTR 301
Objectives	Supports
 Ability to detect and replace defective components in a short time 	Training materials o Simulator
✓ Predictive maintenance	Deliveries \circ Course presentation (printed and .pdf on CD)
Training Content	
Flexium system maintenance	NUMDrive C advanced maintenance
 Detailing the product structure 	 Detailed analysis
 Exchange zone 	 Drives instruments
 Troubleshooting with Flexium HMI 	 Drives exchange procedure
 Flexium Tools Parameters modification Debugging with the PLC 	 Safety application maintenance
 PLC program adjustments Backup and restore 	Questions and answers (1 hour)
Duration	Date / Costs

3 days

Flexium⁺ system advanced maintenance



Your area of interest	Prerequisite
Maintenance	Level FXTR 301
Objectives	Supports
 Ability to detect and replace defective components in a short time 	Training materials o Simulator
 Predictive maintenance 	Deliveries $_{\odot}$ Course presentation (printed and .pdf on CD)
Training Content	
Flexium ⁺ system maintenance	NUMDrive X drives advanced maintenance
 Detailing the product structure 	 Detailed analysis
 Exchange zone 	 Drives instruments
 Troubleshooting with Flexium HMI 	 Drives exchange procedure
 Flexium Tools 	
 Parameters modification 	 Safety application maintenance
 Debugging with the PLC 	
	Questions and answers (1 hour)

Duration

3 days

Date / Costs

NUMDrive C advanced maintenance

Your area of interest

Machine maintenance

Objectives

✓ Ability to detect and replace components or adjust parameters

Prerequisite

Level FXTR 301

Training materials

o Simulator

Deliveries

Supports

• Course presentation (printed and .pdf on CD)

Training Content

Review

- Range description 0
- Troubleshooting with Flexium HMI 0

Components connections

Structure of a NUMDrive C application 0

Adjustments

- Using Flexium Tools for diagnostic
- 0 Main drive parameters
- Adjustment and control 0

Questions and answers

Duration

3 days

Date / Costs



NUMDrive X advanced maintenance

Your area of interest

Machine maintenance

Objectives

✓ Ability to detect and replace components or adjust parameters

Prerequisite

Level FXTR 301

Training materials

o Simulator

Deliveries

Supports

• Course presentation (printed and .pdf on CD)

Training Content

Review

- Range description 0
- Troubleshooting with Flexium HMI 0

Components connections

Structure of a NUMDrive X application 0

Adjustments

- Using Flexium Tools for diagnostic
- 0 Main drive parameters
- Adjustment and control 0

Questions and answers

Duration

3 days

Date / Costs



Flexium system initial setup

Your area of interest

Engineering and Setup

Objectives

- Create a first Flexium application for a machine
- Control basic functions Run two axes and a spindle

Prerequisite

FXTR 201

Supports

Training materials

 \circ Simulator

Deliveries

- Course presentation (printed and .pdf on CD)
- Installation manual Commissioning manual – Flexium Tools (all on CD)

Training Content

Understanding Flexium structure

- Flexium Tools presentation
- Getting familiar with the package
- o Languages
- \circ Variables
- o Structure of a project

Practical exercise

- o Creating the machine structure
- Integrating IOs (CANopen and Ethernet)
- o Integrating a panel
- Handling modes, manual and automatic commands
- Operator messages
- o Power on, security
- o Integrating axes and spindle
- First level of parameterization
- o Running a simple part program
- o Introduction to the custom visualization

Duration

5 days

Questions and answers

Please consult your local training contact

Date / Costs



Flexium system advanced setup



Your area of interest	Prerequisite
Engineering and Setup	FXTR 401
Objectives	Supports
 Commissioning a Flexium system on any kind of machine 	Training materials o Simulator
	 Deliveries Course presentation (printed and .pdf on CD) Full set of Flexium manuals – Flexium Tools Example project (all on CD)
Training Content	
Detailed analysis of exchange variables	Questions and answers
Flexium Tools complements	
 Project simulation and debug Application control (Tables - outemated) 	
 Application control (Tasks – automated checks) 	
 Field bus control 	
 Advanced functions (Probing – tool wear – shutdown etc.) 	
 Custom screens complements 	
 Optional functions (multi NCK – multi panels etc.) 	
 Writing custom libraries 	

Duration

5 days

Date / Costs

Flexium⁺ system advanced setup



Your area of interest	Prerequisite
Engineering and Setup	FXTR 401
Objectives	Supports
 Commissioning a Flexium system on any kind of machine 	Training materials Simulator
	 Deliveries Course presentation (printed and .pdf on CD) Full set of Flexium manuals – Flexium Tools – Example project (all on CD)
Training Content	
Detailed analysis of exchange variables	Questions and answers
Flexium Tools complements	
 Project simulation and debug Application control (Tasks – automated checks) Field bus control Advanced functions (Probing – tool wear – shutdown etc.) Custom screens complements Optional functions (multi NCK – multi panels etc.) Writing custom libraries 	

Duration

5 days

Date / Costs

NUMDrive C on CANopen

Your area of interest

Engineering and Setup

Objectives

✓ Control of one or more NUMDrive C over CANopen

Prerequisite

F?TR 402 required

Supports

Training materials

o Simulator

Deliveries

- Course presentation (printed and .pdf on CD)
- Full set of Flexium manuals Flexium Tools – Example project (all on CD)

Training Content

Recalls on CANopen

NUMDrive C library

o Available parameters and functions

Application

- Parameters settings
- o Position control
- Velocity control

Questions and answers

Duration

2 days

Date / Costs



Extended NCK Access (ENA)

Your area of interest

Engineering and Setup

Objectives

 Exchange of additional data between NCK and PLC

Prerequisite

F?TR 402 required

Supports

Training materials

o Simulator

Deliveries

- Course presentation (printed and .pdf on CD)
- Flexium Tools Example project

Training Content

Structure of internal communication in Flexium systems

ENA library

o Available parameters and functions

Application

- Reading parameters
- o Writing parameters
- Files management

Questions and answers

Duration

2 days





Flexium HMI personalization



Your area of interest	Prerequisite
Engineering and Setup	 FXTR 101 Windows knowledge Programming knowledge of script languages
Objectives	Supports
 Creating Flexium HMI custom pages in HTML/JavaScript 	Training materials o Simulator
	 Deliveries Course presentation (printed and .pdf on CD) Software Development Kit access Example (on CD)
Training Content	
Introduction in the architecture of Flexium HMI Explanation of the Flexium HMI components • FXBrowser • FXServer • FXLib • FXLib • FXLog Structure of configuration files • FXServer.ini • FXUser.ini	 Abstract of development tools Exercises related to practice using HTML and JavaScript Object instancing of the classes of the development components Using of the development components Characteristics of the array structure of event classes Programming examples
 Explanation of the FXServer architecture Event handling task management 	Questions and answers
Duration	Date / Costs

Duration

3 days

Date / Costs

Communication with Flexium



Prerequisite
 FXTR 101 Windows knowledge Knowledge of object oriented programming (OOP) and use of COM server
Supports
Training materials Simulator
 Deliveries Course presentation (printed and .pdf on CD) Software Development Kit access Programming examples in C# and C++ (on CD)
 Exercises related to practice using C# Object referencing and instancing of the classes of the development components Using of the development components Characteristics of the array structure of event
classes Programming examples Questions and answers

Duration

2 days

Date / Costs

Safety including SAM



Your area of interest

Engineering and Setup

Objectives

- ✓ Understand concept.
- Program and Set-Up a safety application on a Flexium system

Prerequisite

FXTR 102 or FLTR 402

Supports

Training materials

 \circ Simulator

Deliveries

- Course presentation (printed and .pdf on CD)
- Software Development Kit access
- Example (on CD)

Training Content

Hardware structure

Safety functions

Safety application concept

Safe PLC programming

Drive functions

- o STO setup
- o SAM setup

Questions and answers

Duration

1 day

Date / Costs

Safety including NUM-SAMX



Your area of interest

Engineering and Setup

Objectives

- ✓ Understand concept.
- Program and setup a safety application on a Flexium system

Prerequisite

FXTR 102 or FPTR 402

Supports

Training materials

 \circ Simulator

Deliveries

- Course presentation (printed and .pdf on CD)
- Software Development Kit access
- Example (on CD)

Training Content

Hardware structure

Safety functions

Safety application concept

Safe PLC programming

Drive functions

- NUM-STOX setup
- NUM-SAMX setup

Questions and answers

Duration

2 days

Date / Costs



Individual trainings

Your area of interest	Prerequisite
Something around NUM controls	Depending on the training content
Objectives	Supports
✓ Will be defined with you	Training materials o Simulator
	 Deliveries Course presentation (printed and .pdf on CD) Example (on CD) if available
Training Content	
Will be developed with you	
Duration	Date / Costs
To be defined	Please consult your local training contact
Individual trainings can happen at NUM locations or	customer site.



Booking Form

For booking of training please send an e-mail to one of the following address with content below:

France:	centre.formation@num.com
Germany:	timo.zaiser@num.com
Italy:	alessandra.villa@num.com
Switzerland:	sales.ch@num.com

United Kingdom: sales.uk@num.com

For other countries, please contact your local sales representative or NUM Switzerland (sales.ch@num.com).

E-mail content

Company name: Contact person: Function: Phone: Address:

Your order number:

Training number: Training date: Training location: Names of the participants: