## **CNC Power Engineering** Always on the move









# CNC and Drives Training catalogue 2023



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 catalogue 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.



### **Content list**

Training with NUM: your advantages	4
Training Centres	
Training Courses	
Proposed Training Paths	
Your Training Contacts	8
Training Organization	
Flexium system description FXTR 101	10
Flexium and Safety FXTR 102	
Operation and basic maintenance FXTR 201	
Advanced part programming FXTR 202	13
Flexium 3D FXTR 213	14
Dynamic operators in C FXTR 223	
High Speed Cutting – 5 axes functions FXTR 233	16
Flexium system maintenance FXTR 301	17
Flexium system advanced maintenance FLTR 312	18
Flexium <sup>+</sup> system advanced maintenance FPTR 312	19
NUMDrive X advanced maintenance FPTR 314	20
Flexium <sup>+</sup> system initial setup FPTR 401	21
Flexium <sup>+</sup> system advanced setup FPTR 402	22
NUMDrive C on CANopen FXTR 423	23
Extended NCK Access (ENA) FXTR 433	
Flexium HMI personalization FXTR 443	
Communication with Flexium FXTR 453	
Safety including NUM-SAMX FPTR 463	27
Individual trainings	28
Booking Form	29



### 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 <sup>+</sup> 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 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
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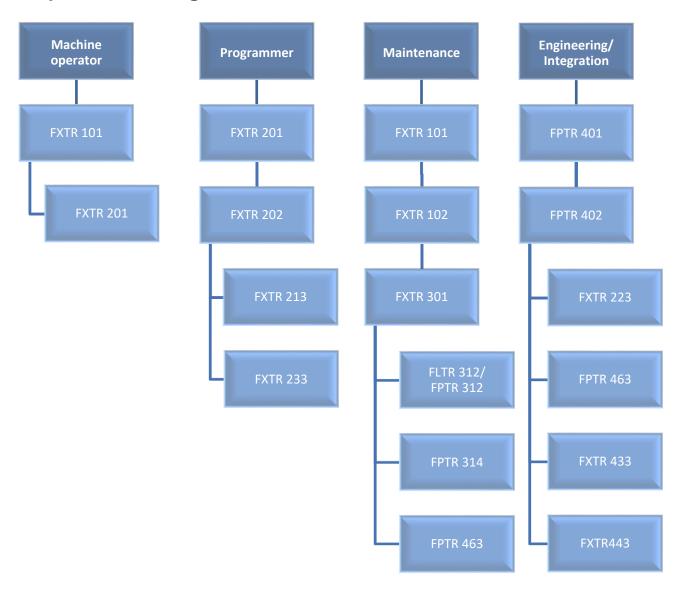
FLTR 312 Flexium advanced maintenance	
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### Flexium+-Specific Training Sessions

FPTR 312	Flexium <sup>+</sup> system advanced maintenance
FPTR 314	NUMDrive X advanced maintenance
FPTR 401	Flexium system initial setup
FPTR 402	Flexium⁺ system advanced setup
FPTR 463	Safety including NUM-SAMX



### **Proposed Training Paths**





### **Your Training Contacts**

#### Austria:

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#### United Kingdom: Steve Moore

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



### **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
<ul> <li>Understanding the Flexium range structure (CNCs and Drives)</li> </ul>	Training materials <ul> <li>Individual components</li> <li>Simulator</li> </ul>
✓ Understanding the main functions	
	Deliveries
<ul> <li>Ability to define a configuration with the Flexium catalogue</li> </ul>	<ul> <li>Course presentation (printed and .pdf on memory stick)</li> </ul>
	<ul> <li>Flexium catalogue (on memory stick)</li> </ul>
Training Content	
Flexium CNC presentation	NUMDrive X presentation
• The different models of CNCs	<ul> <li>Hardware structure</li> </ul>
<ul> <li>Hardware structure – Software functions</li> </ul>	<ul> <li>Drives functions and performances</li> <li>Axes and spindle motors</li> </ul>
The panels	<b>-</b> .
• PC Panels	Tools
<ul> <li>Machine panels</li> </ul>	<ul> <li>PLC programming</li> <li>Web tools</li> </ul>
The PLC	
o Structure	Applications
<ul> <li>Programming languages</li> </ul>	• From the single unit CNC to the multi CNC
o IOs	multi panels configurations
NUMDrive C presentation	Questions and answers (1/2 hour)
• Hardware structure	
<ul> <li>Drives functions and performances</li> <li>Avea and anight maters</li> </ul>	
<ul> <li>Axes and spindle motors</li> </ul>	
<b>-</b>	

#### Duration

1 day

#### Date / Costs

### Flexium and Safety



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

1 day

### **Operation and basic maintenance**



#### Your area of interest

Machine operator – 1<sup>st</sup> 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 memory stick)
- Programming manual (on memory stick)
- Tools
- Web tools
- Flexium license loader

Questions and answers (2 hours)

#### Date / Costs

### Advanced part programming



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

#### **Training Content**

Advanced ISO functions

- Polar programming
- Probing management
- Pocket cycles
- o Complements on parametric programming
  - Detailed information on E parameters
  - Relation with the outside via the PLC •
- o Structured programming
- o Dynamic operators
- o 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 Training materials o Simulator ✓ Interacting with Flexium HMI to correct possible programming faults Deliveries o Course presentation (printed and .pdf on ✓ Optional : Customizing Flexium 3D for memory stick) machine simulation **Training Content** Flexium 3D presentation • Principle of operation • The different screens **Running Flexium 3D** • Program configuration o Defining the blank and the tools • Off line and On line simulation Exercises Optional • Designing a machine model

Questions and answers (2 hours)

#### Duration

1 day + 1 day optional

### Date / Costs

### Dynamic operators in C



#### 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
- $\circ$  Simulator

Deliveries

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

#### **Training Content**

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

#### Duration

1 day

#### Date / Costs

## High Speed Cutting – 5 axes functions



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

### Flexium system maintenance

17

#### 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 memory stick)

#### 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

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

3 days

### Flexium<sup>+</sup> system advanced maintenance

пит 🐼 **FPTR 312** 

Your area of interest	Prerequisite
Maintenance	Level FXTR 301
Objectives	Supports
<ul> <li>Ability to detect and replace defective components in a short time</li> </ul>	Training materials o Simulator
✓ Predictive maintenance	<ul> <li>Deliveries</li> <li>Course presentation (printed and .pdf on memory stick)</li> </ul>
Training Content	
Flexium <sup>+</sup> system maintenance	NUMDrive X drives advanced maintenance
<ul> <li>Detailing the product structure</li> <li>Evaluate a serie</li> </ul>	<ul> <li>Detailed analysis</li> <li>Drives instruments</li> </ul>
<ul> <li>Exchange zone</li> <li>Troubleshooting with Flexium HMI</li> </ul>	Dubara analar na mara dama
<ul> <li>I roubleshooting with Flexium Hivii</li> <li>Flexium Tools</li> </ul>	<ul> <li>Drives exchange procedure</li> </ul>
<ul> <li>Parameters modification</li> </ul>	Optoty application maintanance
<ul> <li>Debugging with the PLC</li> </ul>	<ul> <li>Safety application maintenance</li> </ul>
<ul> <li>PLC program adjustments</li> </ul>	Questions and answers (1 hour)
<ul> <li>Backup and restore</li> </ul>	
Duration	Date / Costs

3 days

#### ate / 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** 

o Course presentation (printed and .pdf on memory stick)

#### **Training Content**

Review

- Range description
- Troubleshooting with Flexium HMI 0

Components connections

• Structure of a NUMDrive X application

Adjustments

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

Questions and answers

**Duration** 

3 days

#### Date / Costs



### Flexium<sup>+</sup> system initial setup

#### Your area of interest

Engineering and Setup

#### Objectives

- Create a first Flexium<sup>+</sup> 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 memory stick)
- Installation manual Commissioning manual – Flexium Tools (all on memory stick)

#### **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
- Integrating axes and spindle
- First level of parameterization
- Running a simple part program
- o Introduction to the custom visualization

#### Duration

5 days

Questions and answers

Date / Costs



### Flexium<sup>+</sup> system advanced setup



Your area of interest	Prerequisite
Engineering and Setup	FPTR 401
Objectives	Supports
<ul> <li>Commissioning a Flexium system on any kind of machine</li> </ul>	Training materials o Simulator
	<ul> <li>Deliveries</li> <li>Course presentation (printed and .pdf on memory stick)</li> <li>Full set of Flexium manuals – Flexium Tools – Example project (all on memory stick)</li> </ul>
Training Content	
Detailed analysis of exchange variables	Questions and answers
Flexium Tools complements	
<ul> <li>Project simulation and debug</li> </ul>	
<ul> <li>Project simulation and debug</li> <li>Application control (Tasks – automated checks)</li> </ul>	
<ul> <li>Application control (Tasks – automated</li> </ul>	
<ul> <li>Application control (Tasks – automated checks)</li> </ul>	
<ul> <li>Application control (Tasks – automated checks)</li> <li>Field bus control</li> <li>Advanced functions (Probing – tool wear –</li> </ul>	
<ul> <li>Application control (Tasks – automated checks)</li> <li>Field bus control</li> <li>Advanced functions (Probing – tool wear – shutdown etc.)</li> </ul>	

#### 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

 $\circ$  Simulator

Deliveries

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

#### **Training Content**

#### Recalls on CANopen

NUMDrive C library

o Available parameters and functions

#### Application

- Parameters settings
- Position control
- o Velocity control

Questions and answers

#### Duration

2 days



### **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

• Simulator

Deliveries

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

#### **Training Content**

Structure of internal communication in Flexium systems

#### **ENA** library

Available parameters and functions

#### Application

- o Reading parameters
- o Writing parameters
- o Files management

Questions and answers

#### Duration

2 days



### Flexium HMI personalization



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

### Duration

3 days

#### Date / Costs

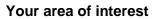
### **Communication with Flexium**



Your area of interest	Prerequisite
Engineering and Setup	<ul> <li>FXTR 101</li> <li>Windows knowledge</li> <li>Knowledge of object oriented programming (OOP) and use of COM server</li> </ul>
Objectives	Supports
<ul> <li>Using of FXServer for the communication with the different components of Flexium</li> </ul>	Training materials <ul> <li>Simulator</li> </ul>
	<ul> <li>Deliveries</li> <li>Course presentation (printed and .pdf on memory stick)</li> <li>Software Development Kit access</li> <li>Programming examples in C# and C++ (on memory stick)</li> </ul>
Training Content	
Introduction in the architecture of FXServer Explanation of the Flexium components (FXServer, FXLib, FXLog) and configuration file (FXServer.ini)	<ul> <li>Exercises related to practice using C#</li> <li>Object referencing and instancing of the classes of the development components</li> <li>Using of the development components</li> <li>Characteristics of the array structure of event classes</li> </ul>
Explanation of the FXServer architecture (Event handling, task management,)	<ul> <li>Programming examples</li> <li>Questions and answers</li> </ul>
Duration	Date / Costs

2 days

### Safety including NUM-SAMX



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 memory stick)
- Software Development Kit access
- Example (on memory stick)

#### **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 <ul> <li>Simulator</li> </ul>
	<ul> <li>Deliveries</li> <li>Course presentation (printed and .pdf on memory stick)</li> <li>Example (on memory stick) if available</li> </ul>
Training Content	
Will be developed with you	
Duration	Date / Costs
To be defined	Please consult your local training contact



### **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: