CNC Power Engineering
Always on the move

CNC and Drives

Training catalogue 2023

num
CNC HighEnd Applications

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.

Content list

CNC HighEnd Applications

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 Centers

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

Some training facilities

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						
Type						
	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

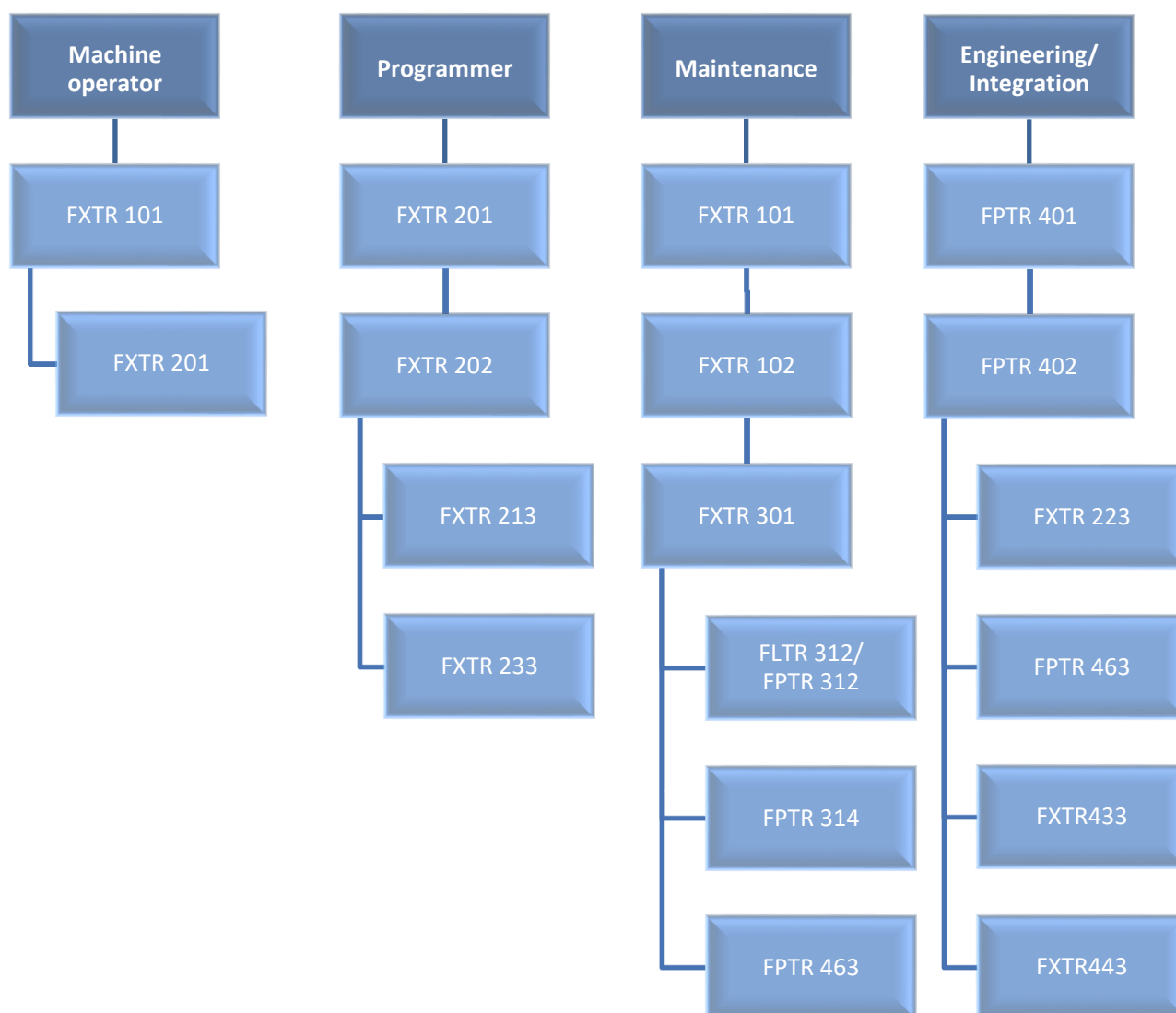|	
FXTR 101	Flexium system description
FXTR 102	Flexium and Safety
FXTR 201	Operation and basic maintenance
FXTR 202	Advanced part programming
FXTR 213	Flexium 3D
FXTR 223	Dynamic operators in C
FXTR 233	High speed cutting – 5 axes functions
FXTR 301	Flexium system maintenance
FXTR 423	NUMDrive C on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

Flexium-Specific Training Sessions

FLTR 312	Flexium advanced maintenance

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Flexium+-Specific Training Sessions

FPTR 312	Flexium$^+$ 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

Machine operator	Programmer	Maintenance	Engineering/ Integration
FXTR 101	FXTR 201	FXTR 101	FPTR 401
FXTR 201	FXTR 202	FXTR 102	FPTR 402
	FXTR 213	FXTR 301	FXTR 223
	FXTR 233	FLTR 312/ FPTR 312	FPTR 463
		FPTR 314	FXTR433
		FPTR 463	FXTR443

Your Training Contacts

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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

FXTR 101

Your area of interest

General knowledge

Prerequisite

None

Objectives

- ✓ Understanding the Flexium range structure (CNCs and Drives)

- ✓ Understanding the main functions

- ✓ Ability to define a configuration with the Flexium catalogue

Supports

Training materials
- o Individual components
- o Simulator

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

Training Content

Flexium CNC presentation
- o The different models of CNCs
- o Hardware structure – Software functions

The panels
- o PC Panels
- o Machine panels

The PLC
- o Structure
- o Programming languages
- o IOs

NUMDrive C presentation
- o Hardware structure
- o Drives functions and performances
- o Axes and spindle motors

NUMDrive X presentation
- o Hardware structure
- o Drives functions and performances
- o Axes and spindle motors

Tools
- o PLC programming
- o Web tools

Applications
- o From the single unit CNC to the multi CNC - multi panels configurations

Questions and answers (1/2 hour)

Duration

1 day

Date / Costs

Please consult your local training contact

Flexium and Safety   FXTR 102

Your area of interest

General knowledge

Prerequisite

None

Objectives

✓ Understanding the Flexium and Flexium⁺ safety concepts

✓ Understanding the various safety features

✓ Ability to define the components and development required for a particular configuration

Supports

Training materials
o Individual components
o Simulator

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

Training Content

Safety: What is it?
o Safety PLCs
o Safe motions
o Safety level

General on EtherCAT and FSoE

The Safe PLC
o Structure
o Programming languages
o I/Os

Safety and Motions
o SAM, STO and NUMDrive C
o SAMX, STOX and NUMDrive X

Questions and answers (1/2 hour)

Duration

1 day

Date / Costs

Please consult your local training contact

Operation and basic maintenance

FXTR 201

Your area of interest

Machine operator – 1st level maintenance

Prerequisite

Knowledge of NUM products or FXTR 101

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

Supports

Training materials
- o Individual components
- o Simulator

Deliveries
- o Course presentation (printed and .pdf on memory stick)
- o Programming manual (on memory stick)

Training Content

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

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

Tools
- o Web tools
- o Flexium license loader

Questions and answers (2 hours)

Duration

2½ days

Date / Costs

Please consult your local training contact

Advanced part programming   FXTR 202

Your area of interest

Advanced part programming – custom macros – special functions for OEM

Prerequisite

Level FXTR 201

Objectives

- ✓ Mastering the advanced ISO functions of the system

- ✓ Ability to create a custom macro (tool changer – milling head exchange – probing etc.)

Supports

Training materials
- o Individual components
- o Simulator

Deliveries
- o Course presentation (printed and .pdf on memory stick)
- o Programming and advanced programming manual (CD)

Training Content

Advanced ISO functions
- o Polar programming
- o Probing management
- o 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

2½ days

Date / Costs

Please consult your local training contact

Flexium 3D   FXTR 213

Your area of interest

Machine operation - Programming

Objectives

✓ Using Flexium 3D to validate a part program

✓ Interacting with Flexium HMI to correct possible programming faults

✓ Optional : Customizing Flexium 3D for machine simulation

Prerequisite

Knowledge of NUM products or FXTR 201

Supports

Training materials
o Simulator

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

Training Content

Flexium 3D presentation
o Principle of operation
o The different screens

Running Flexium 3D
o Program configuration
o Defining the blank and the tools
o 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

Please consult your local training contact

Dynamic operators in C

FXTR 223

Your area of interest

General knowledge

Prerequisite

FXTR 202 and C language

Objectives

- ✓ Develop an application using dynamic operators in C

Supports

Training materials
- o Individual components
- o Simulator

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

Training Content

- o Principle of dynamic operators

- o 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

Please consult your local training contact

High Speed Cutting – 5 axes functions   FXTR 233

Your area of interest

General knowledge

Prerequisite

FXTR 202 and FPTR 401

Objectives

✓ Mastering 5 axes machining functions

✓ RTCP (Rotating Tool Centre Point)

✓ Inclined plane

✓ High speed cutting

Supports

Training materials
o Individual components
o Simulator

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

Training Content

o NC 5 axes functions

o RTCP and inclined plane parameterization

o Application

o High speed machining functions

o Speed and acceleration controls

o Optimization of parameters

o Axes adjustments

o Flexium tools instruments

o Practical case

Questions and answers (1/2 hour)

Duration

2 days

Date / Costs

Please consult your local training contact

Flexium system maintenance   FXTR 301

Your area of interest

Maintenance

Prerequisite

Level FXTR 101

Objectives

✓ Ability to detect and replace defective components in a short time

✓ Predictive maintenance

Supports

Training materials
o Simulator

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

Training Content

Flexium system maintenance
o System structure
o Components
o System startup
o Diagnostics
o Software updates
o Service tool
o Safety
o Part replacement

Drives maintenance
o Product knowledge
o Drives exchange procedure

Questions and answers (1 hour)

Duration

2½ days

Date / Costs

Please consult your local training contact

Flexium system advanced maintenance   **FLTR 312**

Your area of interest

Maintenance

Prerequisite

Level FXTR 301

Objectives

✓ Ability to detect and replace defective components in a short time

✓ Predictive maintenance

Supports

Training materials
o Simulator

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

Training Content

Flexium system maintenance
o Detailing the product structure
o Exchange zone
o Troubleshooting with Flexium HMI
o Flexium Tools
o Parameters modification
o Debugging with the PLC
o PLC program adjustments
o Backup and restore

NUMDrive C advanced maintenance
o Detailed analysis
o Drives instruments
o Drives exchange procedure

o Safety application maintenance

Questions and answers (1 hour)

Duration

3 days

Date / Costs

Please consult your local training contact

Flexium⁺ system advanced maintenance FPTR 312

Your area of interest

Maintenance

Prerequisite

Level FXTR 301

Objectives

✓ Ability to detect and replace defective components in a short time

✓ Predictive maintenance

Supports

Training materials
o Simulator

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

Training Content

Flexium⁺ system maintenance
o Detailing the product structure
o Exchange zone
o Troubleshooting with Flexium HMI
o Flexium Tools
o Parameters modification
o Debugging with the PLC
o PLC program adjustments
o Backup and restore

NUMDrive X drives advanced maintenance
o Detailed analysis
o Drives instruments
o Drives exchange procedure

o Safety application maintenance

Questions and answers (1 hour)

Duration

3 days

Date / Costs

Please consult your local training contact

NUMDrive X advanced maintenance FPTR 314

Your area of interest

Machine maintenance

Prerequisite

Level FXTR 301

Objectives

✓ Ability to detect and replace components or adjust parameters

Supports

Training materials
o Simulator

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

Training Content

Review
o Range description
o Troubleshooting with Flexium HMI

Components connections
o Structure of a NUMDrive X application

Adjustments
o Using Flexium Tools for diagnostic
o Main drive parameters
o Adjustment and control

Questions and answers

Duration

2½ days

Date / Costs

Please consult your local training contact

Flexium⁺ system initial setup

FPTR 401

Your area of interest

Engineering and Setup

Prerequisite

FXTR 201

Objectives

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

Supports

Training materials
- o Simulator

Deliveries
- o Course presentation (printed and .pdf on memory stick)
- o Installation manual – Commissioning manual – Flexium Tools (all on memory stick)

Training Content

Understanding Flexium⁺ structure

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

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

Questions and answers

Duration

5 days

Date / Costs

Please consult your local training contact

Flexium⁺ system advanced setup

FPTR 402

Your area of interest

Engineering and Setup

Prerequisite

FPTR 401

Objectives

✓ Commissioning a Flexium system on any kind of machine

Supports

Training materials
o Simulator

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

Training Content

Detailed analysis of exchange variables

Flexium Tools complements

o Project simulation and debug
o Application control (Tasks – automated checks)
o Field bus control
o Advanced functions (Probing – tool wear – shutdown etc.)
o Custom screens complements
o Optional functions (multi NCK – multi panels etc.)
o Writing custom libraries

Questions and answers

Duration

5 days

Date / Costs

Please consult your local training contact

NUMDrive C on CANopen   FXTR 423

Your area of interest

Engineering and Setup

Prerequisite

F?TR 402 required

Objectives

✓ Control of one or more NUMDrive C over CANopen

Supports

Training materials
o Simulator

Deliveries
o Course presentation (printed and .pdf on memory stick)
o 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
o Parameters settings
o Position control
o Velocity control

Questions and answers

Duration

2 days

Date / Costs

Please consult your local training contact

Extended NCK Access (ENA)　　　　　　　　　　**FXTR 433**

Your area of interest

Engineering and Setup

Prerequisite

F?TR 402 required

Objectives

✓ Exchange of additional data between NCK and PLC

Supports

Training materials
o Simulator

Deliveries
o Course presentation (printed and .pdf on memory stick)
o Flexium Tools – Example project

Training Content

Structure of internal communication in Flexium systems

ENA library
o Available parameters and functions

Application
o Reading parameters
o Writing parameters
o Files management

Questions and answers

Duration

2 days

Date / Costs

Please consult your local training contact

Flexium HMI personalization   FXTR 443

Your area of interest

Engineering and Setup

Prerequisite

- o FXTR 101
- o Windows knowledge
- o Programming knowledge of script languages

Objectives

- ✓ Creating Flexium HMI custom pages in HTML/JavaScript

Supports

Training materials
- o Simulator

Deliveries
- o Course presentation (printed and .pdf on memory stick)
- o Software Development Kit access
- o Example (on memory stick)

Training Content

Introduction in the architecture of Flexium HMI

Explanation of the Flexium HMI components
- o FXBrowser
- o FXServer
- o FXLib
- o FXLog

Structure of configuration files
- o FXServer.ini
- o FXUser.ini

Explanation of the FXServer architecture
- o Event handling
- o task management
- o …

Abstract of development tools

Exercises related to practice using HTML and JavaScript
- o Object instancing of the classes of the development components
- o Using of the development components
- o Characteristics of the array structure of event classes
- o Programming examples

Questions and answers

Duration

3 days

Date / Costs

Please consult your local training contact

Communication with Flexium   **FXTR 453**

Your area of interest

Engineering and Setup

Objectives

✓ Using of FXServer for the communication
  with the different components of Flexium

Supports

Training materials
o Simulator

Deliveries
o Course presentation (printed and .pdf on
  memory stick)
o Software Development Kit access
o Programming examples in C# and C++ (on
  memory stick)

Training Content

Introduction in the architecture of FXServer

Explanation of the Flexium components
(FXServer, FXLib, FXLog) and configuration file
(FXServer.ini)

Explanation of the FXServer architecture (Event
handling, task management, …)

Exercises related to practice using C#
o Object referencing and instancing of the
  classes of the development components
o Using of the development components
o Characteristics of the array structure of event
  classes
o Programming examples

Questions and answers

Duration

3 days

Date / Costs

Please consult your local training contact

Safety including NUM-SAMX

FPTR 463

Your area of interest

Engineering and Setup

Prerequisite

FXTR 102 or FPTR 402

Objectives

- ✓ Understand concept.

- ✓ Program and setup a safety application on a Flexium system

Supports

Training materials
- o Simulator

Deliveries
- o Course presentation (printed and .pdf on memory stick)
- o Software Development Kit access
- o Example (on memory stick)

Training Content

Hardware structure

Safety functions

Safety application concept

Safe PLC programming

Drive functions
- o NUM-STOX setup
- o NUM-SAMX setup

Questions and answers

Duration

2 days

Date / Costs

Please consult your local training contact

Individual training

Your area of interest

Something around NUM controls

Objectives

✓ Will be defined with you

Prerequisite

Depending on the training content

Supports

Training materials
- o Simulator

Deliveries
- o Course presentation (printed and .pdf on memory stick)
- o Example (on memory stick) if available

Training Content

Will be developed with you

Duration

To be defined

Date / Costs

Please consult your local training contact

Individual training courses can be held at NUM locations or at the customer's site.

Booking Form

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

China: jane.liu@num.com

India: info.in@num.com

**Taiwan and
rest of Asia:**   johnny.wu@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: