# CNC Power Engineering
## Always on the move

## CNC, Drives, and Software
## Training Catalog 2025

**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 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

- 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 take place either 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** | | | | | |
| Flexium$^+$ und FlexiumPro | FX | | | | |
| Flexium$^+$ | FL | | | | |
| FlexiumPro | 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

| | |
|---|---|
| FXTR101 | Flexium system description |
| FXTR102 | Flexium and Safety |
| | |
| FXTR201 | Operation and basic maintenance |
| FXTR202 | Advanced part programming |
| FXTR213 | Flexium 3D |
| FXTR223 | Dynamic operators in C |
| FXTR233 | High speed cutting – 5-axis functions |
| | |
| FXTR301 | Flexium system maintenance |
| | |
| FXTR433 | Extended NCK Access (ENA) |
| FXTR463 | Safety including NUM-SAMX |

## Flexium⁺-specific Training Sessions

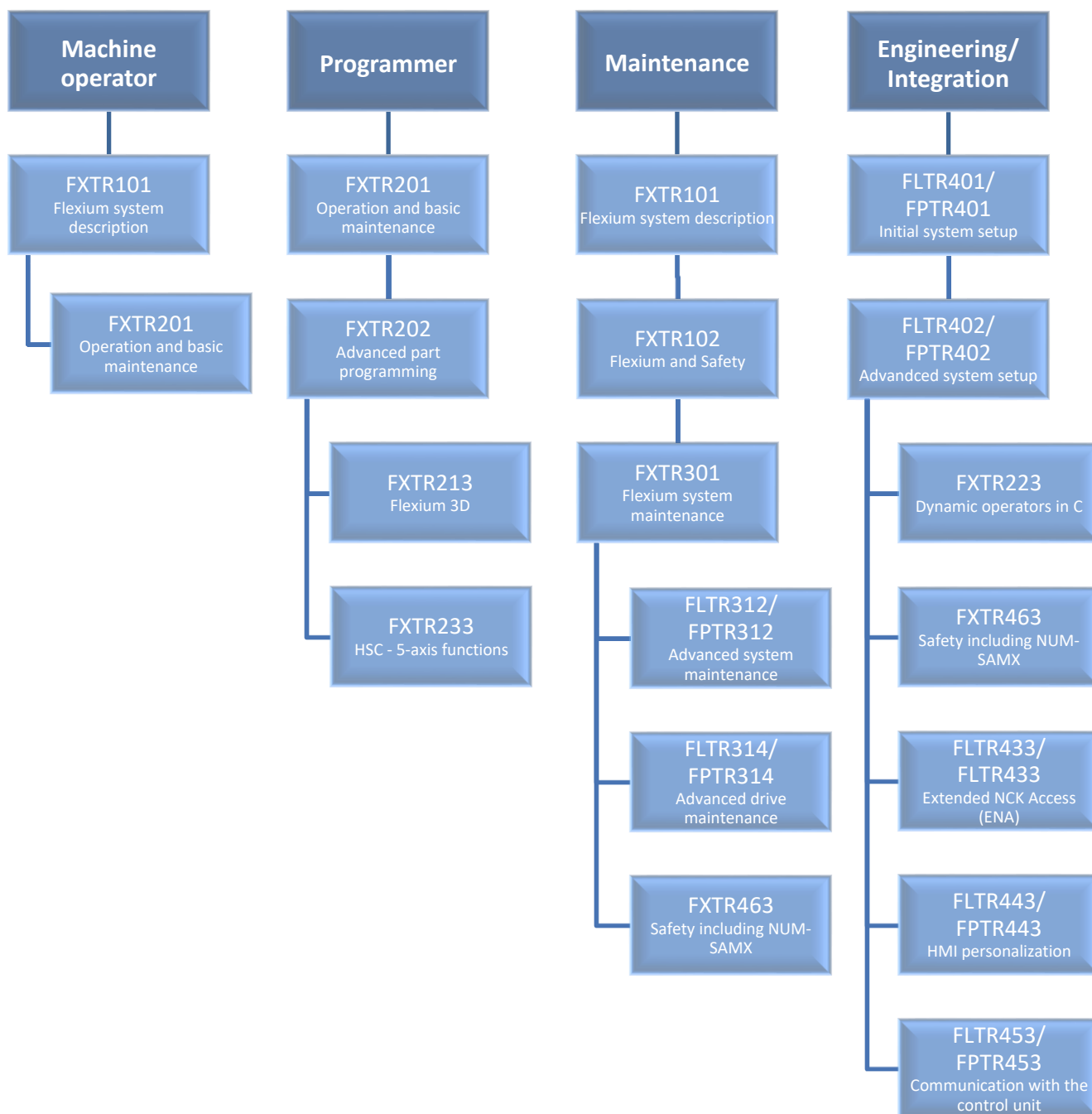| | |
|---|---|
| FLTR312 | Flexium⁺ system advanced maintenance |
| FLTR314 | NUMDrive X advanced maintenance |
| | |
| FLTR401 | Flexium⁺ system initial setup |
| FLTR402 | Flexium⁺ system advanced setup |
| FLTR443 | Flexium⁺ HMI personalization |
| FLTR453 | Communication with Flexium⁺ |


## FlexiumPro-specific Training Sessions

| | |
|---|---|
| FPTR312 | FlexiumPro system advanced maintenance |
| FPTR314 | NUM DrivePro advanced maintenance |
| | |
| FPTR401 | FlexiumPro system initial setup |
| FPTR402 | FlexiumPro system advanced setup |
| FPTR443 | FlexiumPro HMI personalization |
| FPTR453 | Communication with FlexiumPro |

# Proposed Training Paths

## Machine operator

**FXTR101**
Flexium system description

**FXTR201**
Operation and basic maintenance

## Programmer

**FXTR201**
Operation and basic maintenance

**FXTR202**
Advanced part programming

**FXTR213**
Flexium 3D

**FXTR233**
HSC - 5-axis functions

## Maintenance

**FXTR101**
Flexium system description

**FXTR102**
Flexium and Safety

**FXTR301**
Flexium system maintenance

**FLTR312/ FPTR312**
Advanced system maintenance

**FLTR314/ FPTR314**
Advanced drive maintenance

**FXTR463**
Safety including NUM-SAMX

## Engineering/ Integration

**FLTR401/ FPTR401**
Initial system setup

**FLTR402/ FPTR402**
Advandced system setup

**FXTR223**
Dynamic operators in C

**FXTR463**
Safety including NUM-SAMX

**FLTR433/ FLTR433**
Extended NCK Access (ENA)

**FLTR443/ FPTR443**
HMI personalization

**FLTR453/ FPTR453**
Communication with the control unit

# 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 timetable**
Training dates and timetables 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                    FXTR101

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

NUM DrivePro 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                                    FXTR102

## Your area of interest

General knowledge

## Prerequisite

None

## Objectives

✓ Understanding the 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 (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 SAMX, STOX and NUMDrive X or NUM DrivePro

Questions and answers (1/2 hour)

## Duration

1 day

## Date / Costs

Please consult your local training contact

# Operation and basic maintenance                    FXTR201

**Your area of interest**

Machine operator – 1st level maintenance

**Prerequisite**

Knowledge of NUM products or FXTR101

**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 (on memory stick)
o Programming manual (on memory stick)

**Training Content**

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

First level of 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**

3 days

**Date / Costs**

Please consult your local training contact

# Advanced part programming FXTR202

**Your area of interest**

Advanced part programming – custom macros – special functions for OEM

**Prerequisite**

Level FXTR201

**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 (on memory stick)
- o Programming and advanced programming manual (on memory stick)

**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**

4 days

**Date / Costs**

Please consult your local training contact

# Flexium 3D                                    FXTR213

**Your area of interest**

Machine operation - Programming

**Prerequisite**

Knowledge of NUM products or FXTR201

**Objectives**

✓ Using Flexium 3D to simulate and validate a part program

✓ Interacting with Flexium HMI to correct possible programming faults

✓ Optional: Customizing Flexium 3D for machine simulation

**Supports**

Training materials
o Simulator

Deliveries
o Course presentation (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    **FXTR223**

## Your area of interest

Customized CNC extensions

## Prerequisite

FXTR202 and C language

## Objectives

✓ Develop an application using dynamic operators in C

## Supports

Training materials
o Individual components
o Simulator

Deliveries
o Course presentation (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-axis functions     FXTR233

**Your area of interest**

5-axis parts machining

**Prerequisite**

FXTR202 and FPTR401

**Objectives**

✓ Mastering 5-axis machining functions

✓ RTCP (Rotating Tool Centre Point)

✓ Inclined plane

✓ High speed cutting

**Supports**

Training materials
o Individual components
o Simulator

Deliveries
o Course presentation (on memory stick)
o Flexium catalogue (on memory stick)

**Training Content**

o 5-axis NC 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 $\qquad$ FXTR301

**Your area of interest**

Maintenance

**Prerequisite**

Level FXTR101

**Objectives**

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

✓ Predictive maintenance

**Supports**

Training materials
o Simulator

Deliveries
o Course presentation (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
o Drives exchange procedure

Questions and answers (1 hour)

**Duration**

3 days

**Date / Costs**

Please consult your local training contact

# Flexium+ system advanced maintenance     FLTR312

**Your area of interest**

Maintenance

**Prerequisite**

Level FXTR301

**Objectives**

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

- ✓ Predictive maintenance

**Supports**

Training materials
- o Simulator

Deliveries
- o Course presentation (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

# FlexiumPro system advanced maintenance FPTR312

**Your area of interest**

Maintenance

**Prerequisite**

Level FXTR301

**Objectives**

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

✓ Predictive maintenance

**Supports**

Training materials
o Simulator

Deliveries
o Course presentation (on memory stick)

Training course in preparation

**Training Content**

FlexiumPro 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

NUM DrivePro 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      FLTR314

**Your area of interest**

Machine maintenance

**Prerequisite**

Level FXTR301

**Objectives**

- ✓ Ability to detect and replace components or adjust parameters

**Supports**

Training materials
- o Simulator

Deliveries
- o Course presentation (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**

3 days

**Date / Costs**

Please consult your local training contact

# NUM DrivePro advanced maintenance                    FPTR314

**Your area of interest**

Machine maintenance

**Objectives**

✓ Ability to detect and replace components or adjust parameters

**Prerequisite**

Level FXTR301

*Training course in preparation*

**Supports**

Training materials
o Simulator

Deliveries
o Course presentation (on memory stick)

**Training Content**

Review
o Range description
o Troubleshooting with FlexiumPro HMI

Components connections
o Structure of a NUM DrivePro application

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

Questions and answers

**Duration**

3 days

**Date / Costs**

Please consult your local training contact

# Flexium⁺ system initial setup                    FLTR401

**Your area of interest**

Setting up and programming of a Flexium⁺

**Prerequisite**

FXTR201

**Objectives**

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

**Supports**

Training materials
- o Simulator

Deliveries
- o Course presentation (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 control 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          FLTR402

**Your area of interest**

Setting up and programming of a Flexium⁺

**Prerequisite**

FPTR401

**Objectives**

✓ Commissioning a Flexium system on any kind of machine

**Supports**

Training materials
o Simulator

Deliveries
o Course presentation (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

# FlexiumPro system initial setup

# FPTR401

**Your area of interest**

Setting up and programming of a FlexiumPro

**Prerequisite**

FXTR201

Training course
in preparation

**Objectives**

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

**Supports**

Training materials
o Simulator

Deliveries
o Course presentation (on memory stick)
o Installation manual – Commissioning manual – Flexium Tools (all on memory stick)

**Training Content**

Understanding FlexiumPro structure

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

Practical exercise
o Creating the control 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

# FlexiumPro system advanced setup

## Your area of interest

Setting up and programming of a FlexiumPro

## Objectives

✓ Commissioning a Flexium system on any kind of machine

## Prerequisite

FPTR401

## Supports

Training materials
o Simulator

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

*Training course in preparation*

## Training Content

Detailed analysis of exchange variables

FlexiumPro 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

# Extended NCK Access (ENA)                    FXTR433

**Your area of interest**

Setting up and programming of a Flexium

**Prerequisite**

FXTR402 required

**Objectives**

✓ Exchange of additional data between NCK and PLC

**Supports**

Training materials
o Simulator

Deliveries
o Course presentation (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

# FLTR443

**Your area of interest**

Setting up and programming of a Flexium+

**Prerequisite**

o FXTR101
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 (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
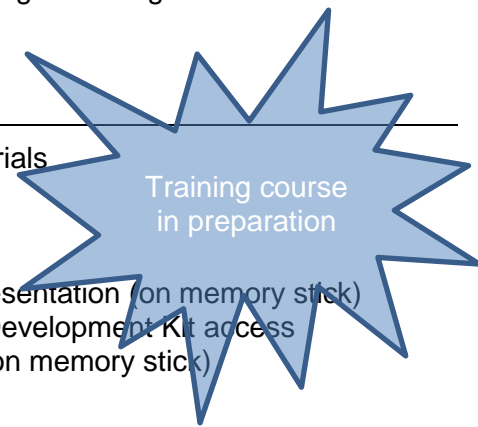
# Communication with Flexium+      FLTR453

**Your area of interest**

Setting up and programming of a Flexium+

**Prerequisite**

- o FXTR101
- o Windows knowledge
- o Knowledge of object oriented programming (OOP) and use of COM server

**Objectives**

✓ Using of FXServer for the communication with the different components of Flexium+. This allows connections to other systems, independent HMIs, etc. to be realized.

**Supports**

Training materials
- o Simulator

Deliveries
- o Course presentation (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**

2 days

**Date / Costs**

Please consult your local training contact
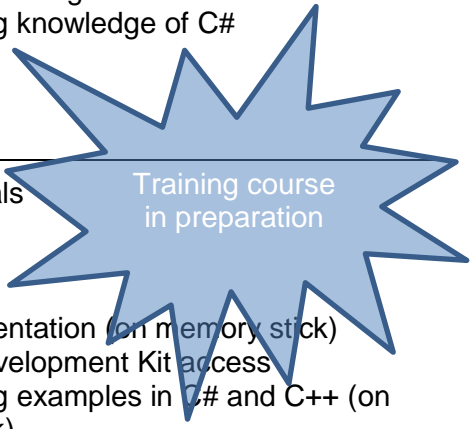
# FlexiumPro HMI personalization     FPTR443

**Your area of interest**

Setting up and programming of a FlexiumPro

**Prerequisite**

- o FXTR101
- o Windows knowledge
- o Programming knowledge of C#

**Objectives**

✓ Creating FlexiumPro HMI custom pages in C#

**Supports**

Training materials
- o Simulator

Training course in preparation

Deliveries
- o Course presentation (on memory stick)
- o Software Development Kit access
- o Example (on memory stick)

**Training Content**

Introduction in the architecture of FlexiumPro HMI

Explanation of the FlexiumPro HMI architecture

Structure of configuration files

Abstract of development tools

Exercises related to practice using C#
- o Programming examples

Questions and answers

**Duration**

3 days

**Date / Costs**

Please consult your local training contact

# Communication with FlexiumPro                    **FLTR453**

**Your area of interest**

Setting up and programming of a FlexiumPro

**Prerequisite**

o  FXTR101
o  Windows knowledge
o  Programming knowledge of C#

**Objectives**

✓  Use of the FlexiumPro SDK for
   communication with the various FlexiumPro
   components. This allows connections to
   other systems, independent HMIs, etc. to be
   realized.

**Supports**

Training materials
o  Simulator

Training course
in preparation

Deliveries
o  Course presentation (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 FlexiumPro
SDK

Exercises related to practice using C#
o  Programming examples

Questions and answers

**Duration**

2 days

**Date / Costs**

Please consult your local training contact

# Safety including NUM-SAMX

# FXTR463

### Your area of interest

Setting up and programming of a Flexium

### Prerequisite

FXTR102 or FPTR402

### Objectives

✓ Understand concept.

✓ Program and setup a safety application on a Flexium⁺ or FlexiumPro system

### Supports

Training materials
o Simulator

Deliveries
o Course presentation (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 trainings

## Your area of interest

Something around NUM controls

## Prerequisite

Depending on the training content

## Objectives

✓ Will be defined with you

## Supports

Training materials
- o Simulator

Deliveries
- o Course presentation (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 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: