

Course code
Title
Main topic
Subject
Level
Knowledge required (suggested)
Course duration (days)
Agenda

C01
OPENcontrol HW Configuration and SW Installation
HW/SW
HW Configuration and SW Installation
1
Basic CNC and remote devices on bus knowledge
2
<p>OPENcontrol HW models and devices Boards and fieldbuses. ODM system configurator. Calibration Tool setup tool. EtherCAT ODE configurator. SW installation</p> <ul style="list-style-type: none"> - BIOS - Operating System - CNC SW - PC applications <p>Backup and restore modes</p>

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C02
End User HMI
SW
WinNBI End user applications
1
Basic CNC knowledge
1
<p>BootController</p> <p>ProcessController (Standard HMI screens)</p> <ul style="list-style-type: none"> - HMI screens components - Machine setup - Origin preset - Program management - Searching memory - Multi Block Retrace <p>System History</p> <p>FileBrowser- File management</p> <ul style="list-style-type: none"> - Drag&Drop - Logic drives configuration - Local files (PC/CNC) <p>Table Editor</p> <p>Machine Plot</p> <p>IsoView</p> <p>User data area Backup and from Security</p>

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C03
Screen customization
SW
WinNBI ProcessController/Layout Builder
1
Basic CNC knowledge
1
<p>ProcessController and LayoutBuilder</p> <ul style="list-style-type: none"> - general functions (Run-Time and Design Time) <p>Creating and enabling a HMI screen</p> <ul style="list-style-type: none"> - default and dedicated lists - HMI screen selection modes - multi cnc HMI screen <p>Graphics operations</p> <ul style="list-style-type: none"> - copy/paste, move, drag, stretch etc. - layer definition <p>Properties</p> <ul style="list-style-type: none"> - fonts, dimensions etc. <p>Predefined graphic objects</p> <ul style="list-style-type: none"> - detail analysis <p>Customized graphic objects (buttons, images etc.)</p> <ul style="list-style-type: none"> - detail analysis - PLC interaction <p>Utility</p> <ul style="list-style-type: none"> - HMI screen translation - variable list - local variables and dedicated DLL (mention)

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C04
PLC programming
SW
Machine Logic programming
2
Basic CNC knowledge
2
<p>4Control development Tool</p> <p>Machine logic structure</p> <ul style="list-style-type: none"> - PLC - Data area - Time task - Event task - Consent task - Priority, scheduling etc. - Calls to function (mode) <p>Data area details</p> <ul style="list-style-type: none"> - System and Process data area - Interpolators and axis data area - Global and local data area - Tables - Input, Output and in memory variables <p>Console and Part Program consent task details</p> <p>Axes motion management by PLC</p> <p>Functions and Function Blocks Overview</p> <ul style="list-style-type: none"> - Communication with processes (Channels) library - Axes movement by PLC library - General functions library - Axes management library - CANopen management library - XML files management library - TCP/IP by logic communication library - Serial management library <p>Searching memory management and Multi Block Retrace</p>

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C07
PLC application
SW
Use and customization of standard OSAI Machine Logic
2
Basic CNC knowledge Participation in C04 course
1
<p>Installation</p> <p>AMP configuration analysis</p> <p>Logic configuration</p> <p>Pre-assigned I/Os management</p> <p>Overview pre-defined logic functions</p> <ul style="list-style-type: none"> - Enabling and Axes reference - Process and Axes status information - Spindle - Emergencies - Hold/Feedhold - Console - CANopen device - Modbus device - Pneumatic devices (clamps, part locking, references magazines etc.) - Tool change - M codes - Joystick/Handwheel for manual movement - PLC messages <p>Customization of pre-defined functions</p> <p>Specific HMI screens</p> <p>Macro customization (part program)</p> <ul style="list-style-type: none"> - Tool Change - Tool Preset - Probing - Axis homing

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C05
ISO programming base
SW
Basic ISO programming course 2D½ machining
2
CNC basic knowledge
1
<p>Programming with OPENcontrol system</p> <ul style="list-style-type: none"> - IProgram files - ISO program components - Block types - Programmable functions - G codes - ISO program execution and synchronization - Change of the execution sequence <p>Axes programming</p> <ul style="list-style-type: none"> - Axes movements - Origins and control of coordinates and trajectory - Change of the axis reference system - Overtravel and protected areas <p>Tools and offsets programming</p> <p>Tool radius compensation</p> <p>Spindle programming</p> <p>M auxiliary functions</p> <p>Parametric programming</p> <p>Canned cycles</p> <p>Probing cycles</p> <p>Communications management</p> <p>Technological variables, Tables</p>

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C06
Advanced ISO programming
SW
ISO programming advanced course 3D machining
3
ISO CNC programming
1
<p>Programming with OPENcontrol system</p> <p>High speed programming (SPLINES)</p> <ul style="list-style-type: none"> - Points programming and profile features - Curve change management - Angles management - Splines control commands - Spline kinematics transformation <p>Virtualizations</p> <ul style="list-style-type: none"> - Polar coordinates programming - Cylindrical coordinates programming - Non-orthogonal axes programming <p>3D Transformations</p> <ul style="list-style-type: none"> - Rotation of the Cartesian coordinates - Tool Center Point (TCP) <p>Tool direction/offset vectors programming</p> <ul style="list-style-type: none"> - Kinematics identification - Tool Center Point for machines with Prismatic head - Tool Center Point of the tool-length only - Tool Center Point for general machines - UPR and tool offsets <p>Paramacros</p> <p>Multi-process management (multi-channel)</p> <ul style="list-style-type: none"> - Functional notes on process synchronization - Process control commands - Notes on "acquiring/releasing axes" functions <p>Programming of axes movement Filters</p> <p>Notes on XML programming</p> <p>Volumetric Compensation management</p>