



**WaterJet CNC Control System
Technical Specifications:**

1. Hardware specifications:



1.1. Embedded IPC:

The IPC has an Intel® Atom™ multi-core processor with a clock rate of 1.75 GHz. This makes genuine multi-core technology possible in the Embedded PC segment. The hardware interfaces in this new series are oriented and implemented also is characterized by low power consumption and fan less design.

The extended operating temperature range from -25 to +60 °C enables the use in climatically demanding environments.

Specifications:

- Embedded Beckhoff® IPC, durable parts, Germany made.
- Operation system: Microsoft® Windows Embedded Standard 7 P.
- Very compact design, Din rail mount: 142x100x91 mm.
- Low power consumption: 24Vdc,16W max.
- Extended operation temperature range: -25 °C to +60 °C.
- Ports: 2 Gigabit Ethernet, 4 USB, DVI-I interface.
- Integrated 1- second UPS: that continues to supply the processor with power in the event of a power failure, during this period working data will be saved, and a quick shutdown will be executed.

1.2. IO Modules:

- EtherCAT interface.
- Durable, Germany made.
- Unlimited and Easy to install and extend IO modules.
- Compact design: width: 12 mm, height: 100 mm, depth: 70 mm.
- Easy wiring: integrated screwless spring force technology for fast and simple assembly.
- Extended operation temperature range: -25 °C to +60 °C.
- LED indicator for each channel preview its signal state.

Standard IO Types (depended on required options):

- 4/8/16 channel digital input, 3ms filter.
- 8 channel digital output, 2A or 0.5 A.
- 4 channel relay contact outputs.
- 2 channel analog input 0-10V, 0-20mA or 4-20mA.
- 2 channel analog output 0-10V, 0-20mA or 4-20mA.
- DC motor control output (for abrasive feed or proportional valve).

2. Software specifications:

2.1. General Specifications:

- Touch screen program layout for easy user control.
- Integrated CAM program with built-in templates and DXF import.
- Integrated operation interface with PLC functions.
- Event and Alarms monitoring.
- Machine status preview: (power off, Jog, Goto, Goto ready, Run, Pause, Emergency).
- Selectable Machine or Part coordinate display.
- Can check each axis parameters: position, speed, error.
- Override speed to change moving speed on the fly (1 to 200% programable).
- Manual jog the axes or automatically go to any position or point on the screen.
- Advanced speed look ahead to take most performance of your machine.
- Machine setting with 2 levels control (user and factory), for all machine and PLC and Axes control.
- Multi language selection (Chinese, English) can be expanded to other languages by editing Excel file.
- Inch or mm program option.
- 2D compensation for X,Y correction.
- 5Axes compensation: Make 5 Axes calibration easier and more affective, and result a very high accuracy with beveling cutting.

2.2. CAM Specifications:

- Import of DXF-files with auto detect of inners and outer of each part.
- Import shape from Built in Templates and change any dimensions.
- Material database: automatically select the suitable WaterJet cutting parameters.
- DXF checker: check error is DXF drawing (overlap, open contours), and fix them without going back to the CAD program.
- Auto cutting speed calculation by select material, thickness, cutting quality, abrasive rate, pressure, focusing tube and orifice diameter.
- KERF: easily set and change the Kerf for tool offset compensation.
- Using two cutting speed one (low) for corners and other (high) for rest of parts to improve cutting time & quality.
- Changing speed on steps to prevent the water stream affecting the cutting quality.
- Set piercing parameters:
 - A. Three different Lead in & Lead out types: outers, inners, and slits, which could be changed manually.
 - B. Leads are positioned automatically and can be moved manually.
 - C. Two different Pierce type: fixed or circular with programmable time, which load automatically from material database.
 - D. 5axes vertical or bevel piercing.

- Block nesting for one part or group of parts.
- Edit the Parts: scale, move, rotate, copy, cut, paste, and delete parts.
- Cutting sequence is generated automatically upon the selected strategy, and can be changed manually.
- After cutting is finished, cutting head can go to start of job or to specified point.
- Contour type can be changes manually among inner, outer, or cut on path.
- Geometry Optimization for marble cutting to assemble inners and outers directly.
- Bevel cut: Perpendicular or Fixed angle beveling, and can set deferent Perpendicular beveling types for any Shape or Line.

2.3. Operation Specification:

- Can run, pause and go backward.
- Select override speed 1 to 200% (programable).
- Can run job without cutting for test.
- Can change the KERF during cut without going back to CAM.
- Return to cutting path automatically after jog, power off, emergency....
- Can go to any point on cutting path, or any pierce.
- Zoom, show grid and tracking cutting head.
- draw moving head trace for cutting and free moving in deferent colors, with clear trace option.
- Show G-Code and the current active line.

2.4. Sheet Control:

- Can easily select reference point for the sheet among the machine.
- Select reference sheet point from the 4 sheet corners (or part box 4 corners).
- Rotate the job manually or calculate the sheet angle automatically by select two points on the sheet side.
- Can set, preview and go to any of 6 reference Home Points.
- Laser control option: for easy reference point setting (laser pointer provided by customer)

2.5. Waterjet Control:

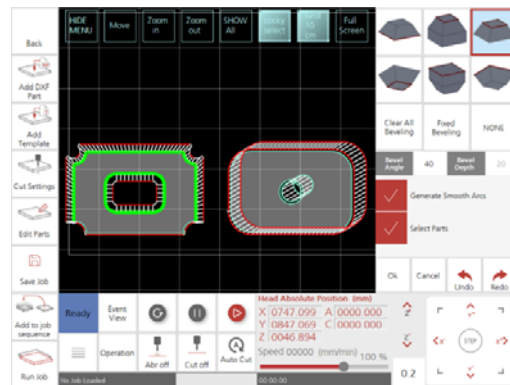
- Select abrasive rate by interactive slide bar.
- Select Cutting high pressure by interactive slide bar.
- Select Piercing low pressure by interactive slide bar.
- Manual or auto select cutting and piercing pressure.
- Can runtime change Cut Settings values (Piercing type & time, focusing tube, orifice, pressure, abrasive and abrasive-water delay), and automatically Recommended Over Speed suggesting maintaining the cutting quality.

3. Standard 3-Axes Controller (CN-3X):

- Beckhoff® IPC + TwinCat® license + Microsoft® Windows Embedded 7 license.
- 8 digital inputs module + 8 digital outputs module (or 2x4relay module)
- 3 Axes Control X, Y, Z.
- Gantry Axis.
- Dual Z option.
- Integrated CAM (DXF,template), block nesting.
- waterjet control interface.
- 2D and Backlash Compensation.
- Laser Zero control.

4. Advanced 5-Axes Controller (CN-5X):

- Beckhoff® IPC + TwinCat® license + Microsoft® Windows Embedded 7 license.
- 8 digital inputs module + 8 digital outputs module (or 2x4relay module)
- 5 Axes Control X, Y, Z, AC or AB.
 - Support limited and unlimited rotation for C axis.
- Gantry Axis.
- Dual Z option.
- Integrated CAM Advanced Beveling, (DXF,template), block nesting.
- Tapper removing option.
- waterjet control interface.
- 5Axes Compensation.
- 2D and Backlash Compensation,
- Laser Zero control.

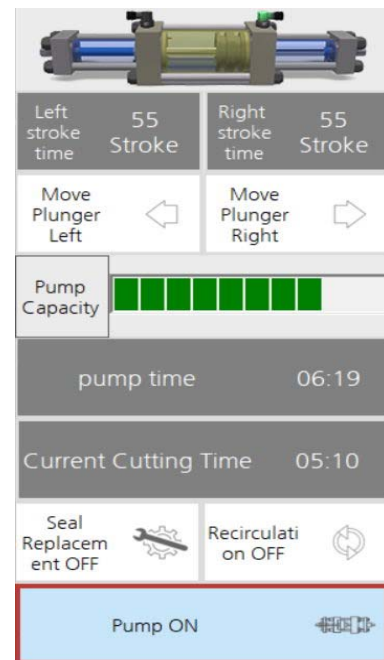


OEM Pump Functions (CN-OEM):

Control any type of OEM high pressure pump, without need for any other PLC or HMI at the pump all control from same controller interface,

Include:

- Built in PLC functions to control the pump IO signals.
- Diagnostic page for technician to check all pump signals, with ability to force any input or output signal.
- Pump control functions: Pump on/off, recirculation, plunger maintenance moving, Pressure control, calculate pump and stroke times.
- Monitor pump signals and display Pump warnings and Alarms.
- 8 digital inputs module + 8 digital outputs module (or 4 relays output)



5. Analog controller for Proportional Valve & Abrasive (CN-A01):

Analog output Controller for Set Values for Pump Pressure and Abrasive rate, depending on material database:

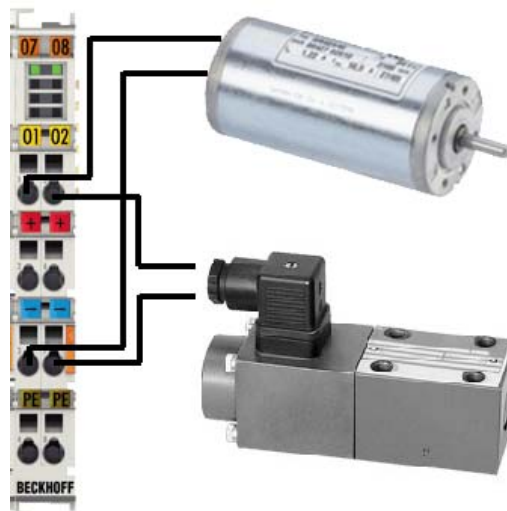
- 2 analog outputs (0-10v or 0-20mA)
- pressure calibration function, for fine adjusting.
- Can automatically or manually set the Pump Pierce pressure, Cutting pressure and Abrasive values, and change any time.
- Automatically set the cutting speed depending on the pressure and abrasive values.
- Automatically suggest Recommended Overspeed value, when changing the active pressure and abrasive values.

6. Proportional Valve & Abrasive Feeder Driver (CN-A03):

Use Compact Dual DC controller for control the Proportional valve and Abrasive feeder motor directly, no need for other drivers:

- Beckhoff® Durable Module, Germany Made.
- Compact size: W x H x D = 15 mm x 100 mm x 70 mm.
- Dual output 2X 1A /24Vmax, (can be expendable to 3.5A with cooling fan).
- overload- and short-circuit-proof.

Note: this option must be ordered with Analog Controller option (CN-A01).



7. Laser Surface Mapping (CN-MAP01-S):

Contronest use high accurate laser scanning sensor to scan the material surface before cutting then sending the sheet imperfection map to the controller,

the controller will then follow the map to keep constant distance between the cutting head and the sheet.



The mapping can be done simply by quick 4 points scanning for straight surface, or complete surface scanning up to 40000 points.

Advantages of surface mapping option:

- Increase the cutting accuracy when using beveling or 5-Axes cutting. and high cutting accuracy specially when cutting with beveling
- Keep constant distance between the cutting head and the sheet surface.
- Increase the cutting speed when making the nozzle closer to surface.
- having same cutting quality for all working surface.
- Eliminate the sheet height difference because of the wearing of holding grid.
- Save the cutting nozzle from touching the sheet surface.

Specifications:

Automatic laser sensor distance adjustment	Yes
Laser scanning sensor Repeatability	70 μ m
Scanning center distance	100 mm
Scanning range	\pm 35 mm
Scanning speed	3000 mm/min
Scanning points	4 to 40000 points

Notes:

- Laser sensor fixing : on bridge or on Z axes.
- The OEM can install laser sensor on actuator, with safety limit sensors.

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