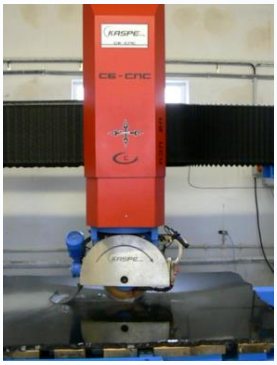
# MEFI CNC 872 series control systems

*Applications for stone-cutting machines*

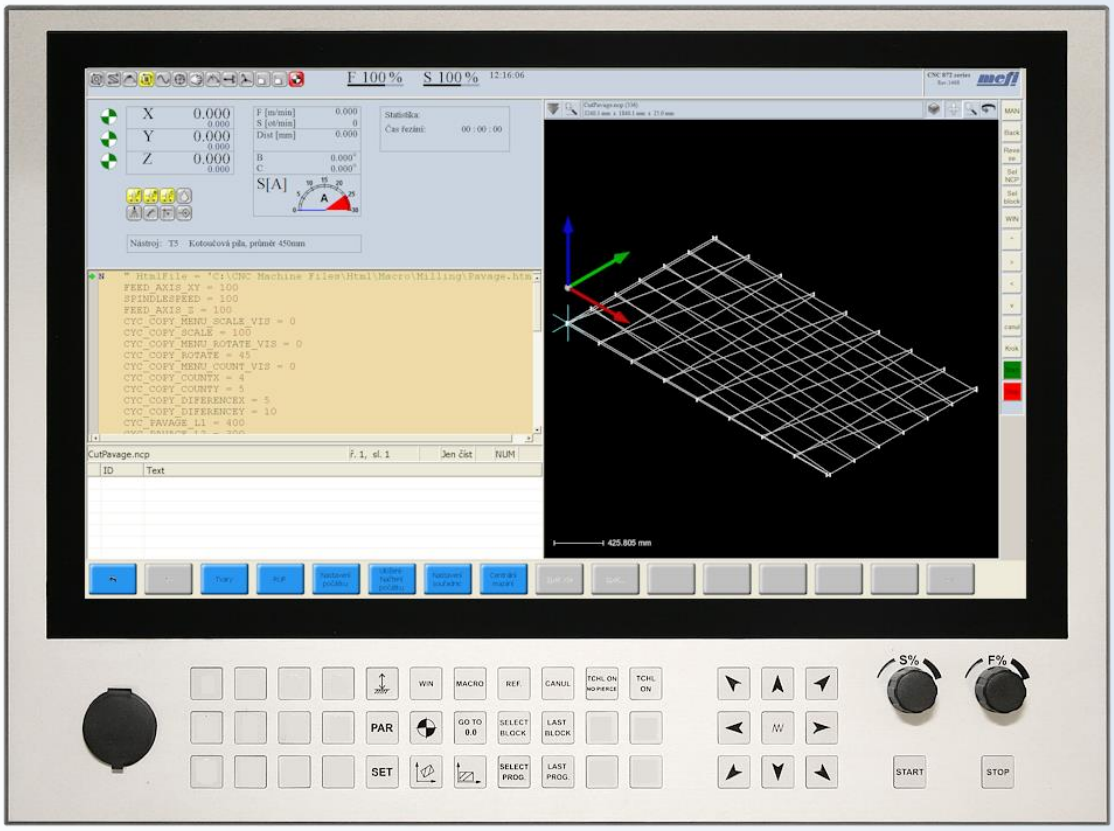
Cutting with a circular saw



Cutting a circular plate

Milling

Control panel



# MEFI CNC 872 stone cutting – solution for cutting stone and similar materials

## Complete solution
We will provide full support to ensure that your machine will actually work.

## All in one
A complete solution including both hardware and software needed to control the machine used to process stone and other similar materials.

## A Common Foundation
When preparing for deployment, we build upon existing software, which we always customize to the specific machine and the customer's specific requirements.

## Extensibility and customizability
At the customer's request, we are prepared to add support for additional features and peripherals, modify the user interface, or customize the operator panel.

## Durability
All components are ready for use in a demanding industrial environment, individual components are adapted for the use of specific technology.

## For both new and older machines
For new machines, we can help optimize the overall design. For older machines, we adapt to the existing configuration so that as many existing components as possible can be retained, and the control system can be replaced quickly and at low cost; of course, a complete reconstruction of the electrical system is also an option.

## Vendor independence
The ability to connect devices from many other manufacturers, particularly servo drives and I/O modules.

## Long-term support and service
By using industrial components, we are able to provide service for a minimum of 10 years. However, even after this period, we will offer the optimal solution to extend the life of the machine without the need to replace other components.

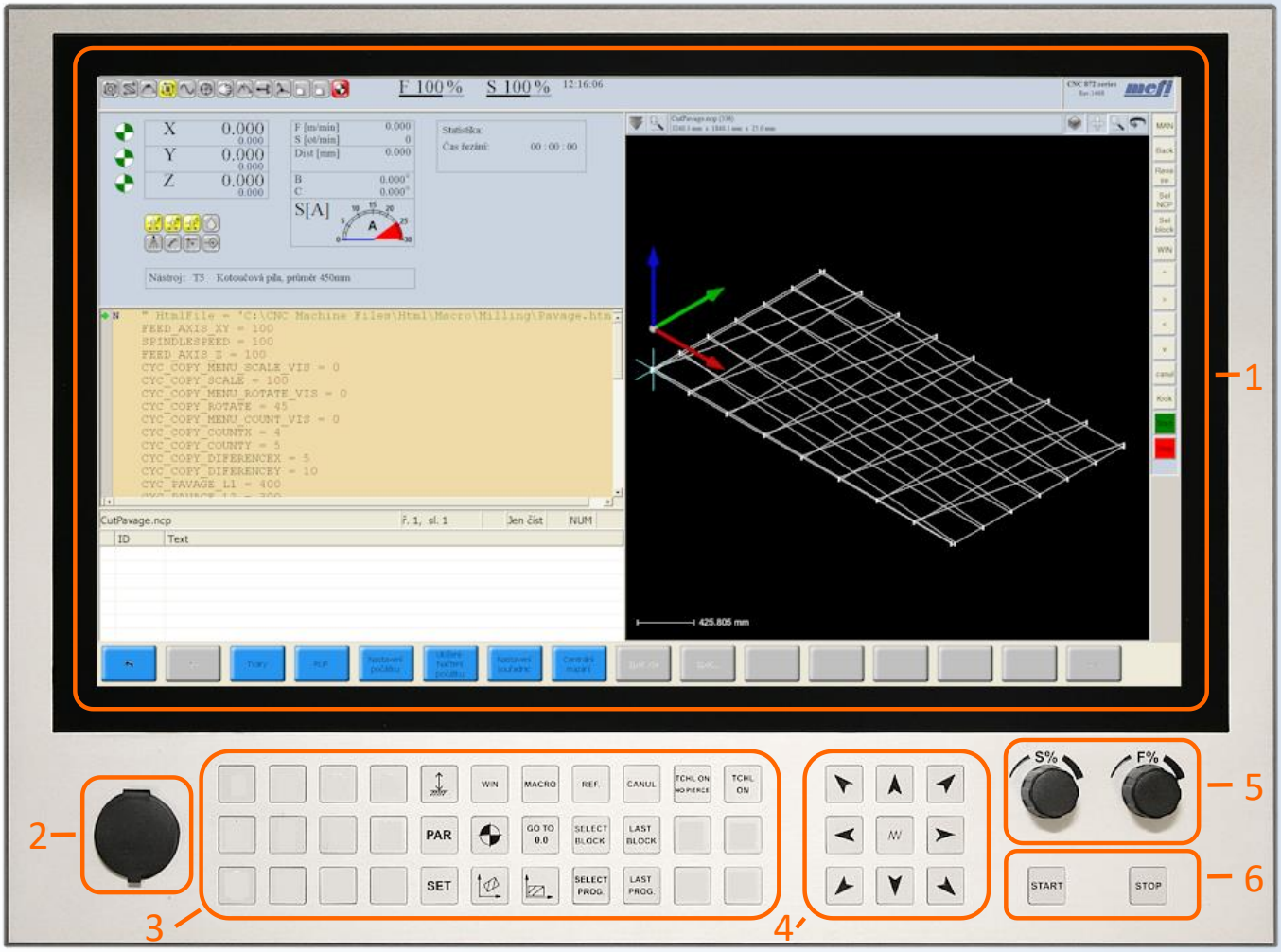
## Basic characteristics

- Cutting options
  - Bevel cutting with a circular saw by tilting it to the desired angle.
  - Cutting tiles of various sizes, cutting strips, cutting circular and elliptical slabs, and cutting triangles and other shapes according to the program.
- Easy to use, advanced features
  - Manual or automatic workpiece positioning (rotation, translation, size, etc.) with the option to save settings.
  - Easy selection of the starting point.
  - Quick shop-floor programming via dialog-based entry of the most common shapes.
  - Ability to create custom part programs, including parametric programming.
- Integration into the corporate environment
  - Monitoring of job parameters (total machining time, cut length, etc.)
  - Machine usage statistics – monitoring of machine and individual tool operating time, total cut length, cut length of individual tools, etc.
  - Automatic or manual generation of machine usage reports.
  - OPC-UA support.
  - Estimation of machining time before starting work.
  - Ability to run the software in simulation mode on a standard PC – easy training and testing.
- Improving machine accuracy
  - Machine backlash compensation.
  - Nonlinear corrections – corrections for axis nonlinearity, tilt, deflection, and similar issues.
- Maintenance and troubleshooting
  - Monitoring of individual tool usage.
  - Remote support and diagnostics.
  - Error and event logging for diagnostic purposes.
  - Service schedule – alerts you when a part needs to be replaced, maintenance is required, or routine service is due.

# Common features

## Operator panel

The operator panel is designed for fast and intuitive operation. It is equipped with a multi-touch display that makes all control system functions easily accessible. At the same time, it offers considerable flexibility by allowing only those controls that are needed on the machine to be displayed. Physical buttons below the display are dedicated to controlling machine movements. The tactile response makes it easier to operate the machine. A part of the physical buttons is also dedicated to control the most used machine functions.

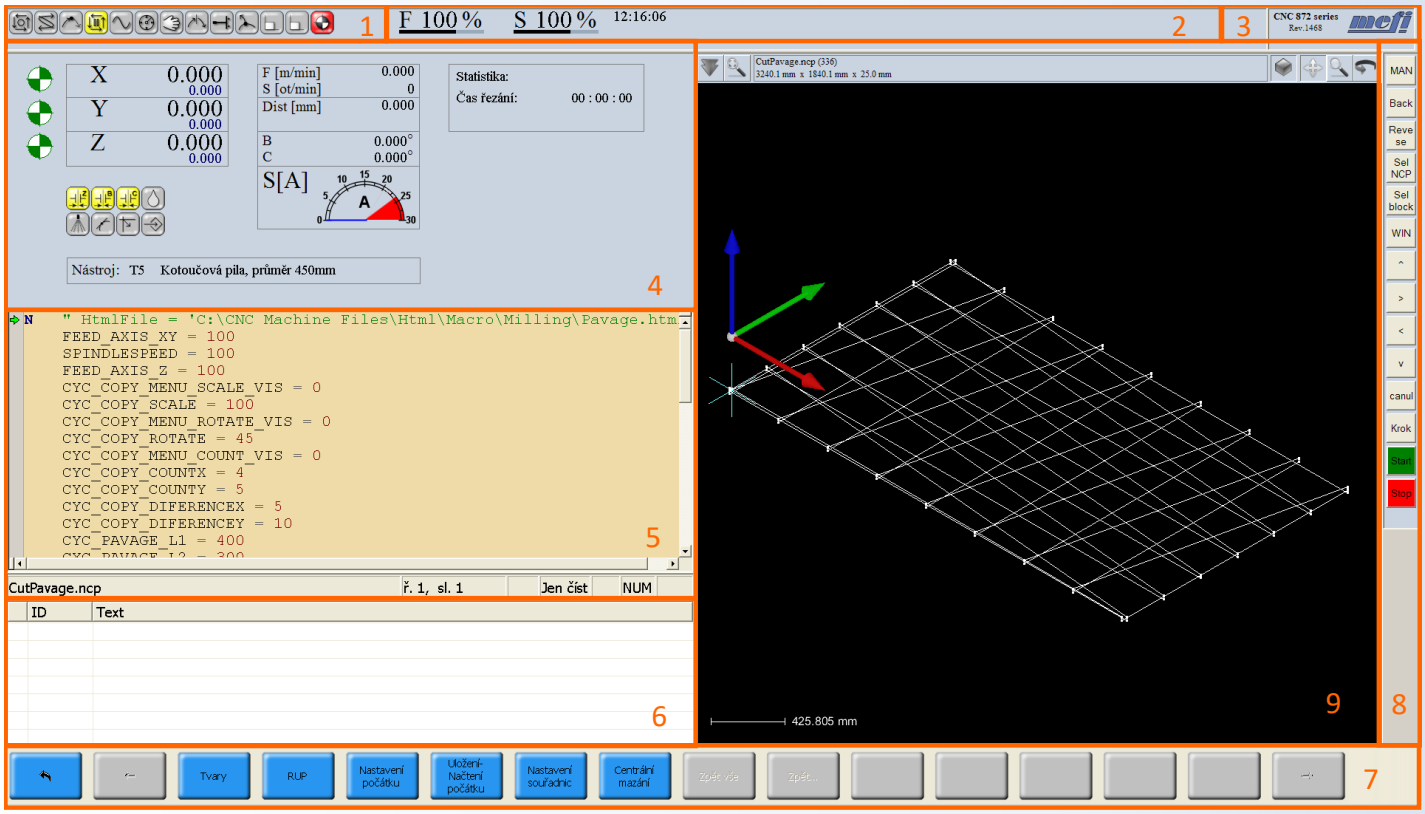



*Control system panel*

1. *Multi-touch display.*
2. *Dual USB connector for connecting flash memory, keyboard or other peripherals.*
3. *Buttons for controlling the most used functions of the control system and the machine. The layout can be adapted to a specific machine line.*
4. *Buttons to control movements.*
5. *Potentiometers for adjusting speed and rotational speed compared to the programmed values.*
6. *Start and Stop buttons.*

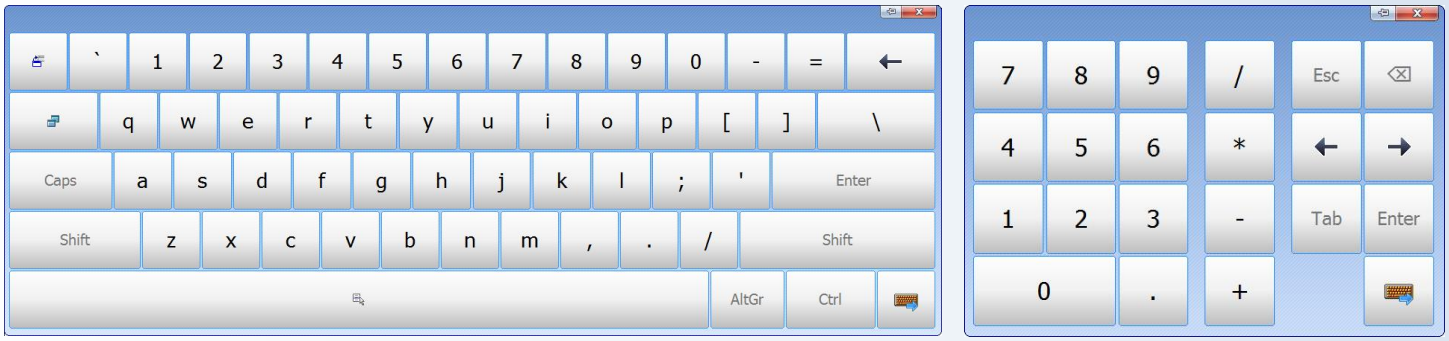
## User interface

The user interface is fully adapted to touch control. The main screen shows the status of the machine and other connected devices and information about the program being executed in an intuitive way, while the most used functions are easily accessible.




*Control system user interface main screen*

1. *Machine status indication.*
2. *Feed override, speed override, current time and, optionally, other elements specific to the machine.*
3. *Information about the software and its revision.*
4. *Information about position, speed, RPM, and other parameters important for machine operation.*
5. *NC program or edited file.*
6. *Persistent messages window.*
7. *Software menu.*
8. *Buttons to access the most used functions.*
9. *Graphical preview of NC program, name of the executed program and its dimensions, optionally other information.*




*Software keyboard (different variants)*

## Localization

The software is fully localized into the following languages (partial localization is available for other languages, where only the most important parts of the software are translated):

- Czech
- English
- German
- Polish
- Russian

## Set up the workpiece

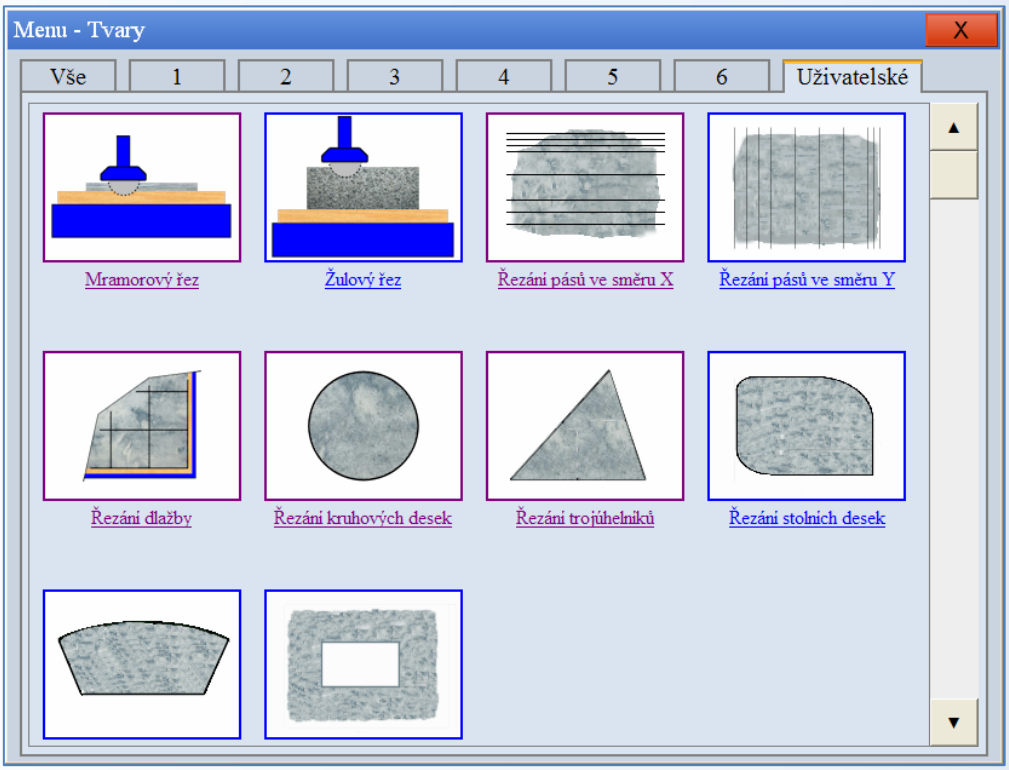
- Automatic setup
- Manual setup

## Technological features

- Kerf width compensation.
- Making bevel cuts by tilting the saw to the desired angle.
- Possibility of milling.

## Workshop programming

- Shapes – the most commonly used shapes are available; after entering the required dimensions and any other parameters, you can start machining without having to generate NC code.
- On request, we can prepare customized shapes.




*Dialog with shape selection*

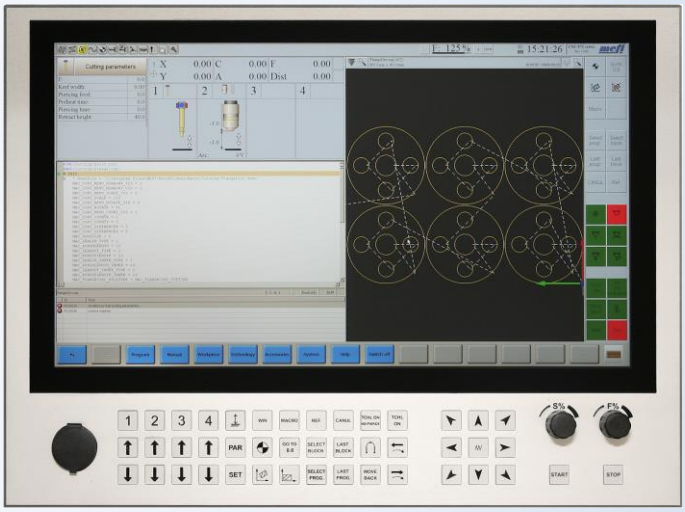
# Hardware

The basis of our production is our own control system in several variants. In addition, we also supply other accessories and electronic modules.

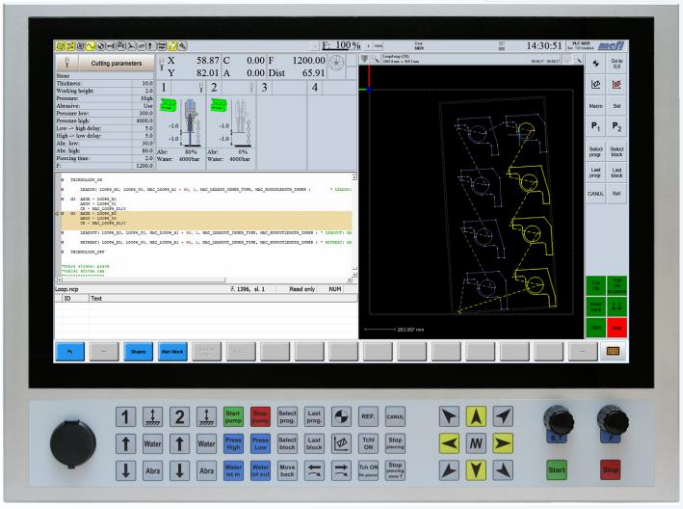
## Control system

The control system, based on an industrial computer, is integrated in the operator panel, which is equipped with a multi-touch display, technology and motion control buttons, potentiometers and a dual USB connector. The control system is available in several variants:

*Basic version (18" display, plastic buttons)*



*Silver variant (18" display, aluminum buttons)*



*Variant with foil keyboard (18" display, foil keyboard)*


*Economy variant (15.6" display, reduced number of buttons)*

## Remote control with joystick

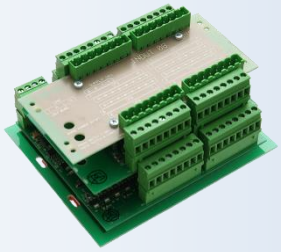
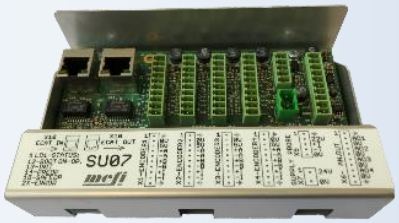
A useful accessory, especially for larger machines or those where the control system is fixed in place (and does not move with the gantry), is a remote control with a joystick, which allows for easy and precise control of movements. The button layout is selected based on the machine type and the customer's preferences. A version with a membrane keypad is also available to protect against cooling water splashes.

*Remote control with a joystick – standard variant*

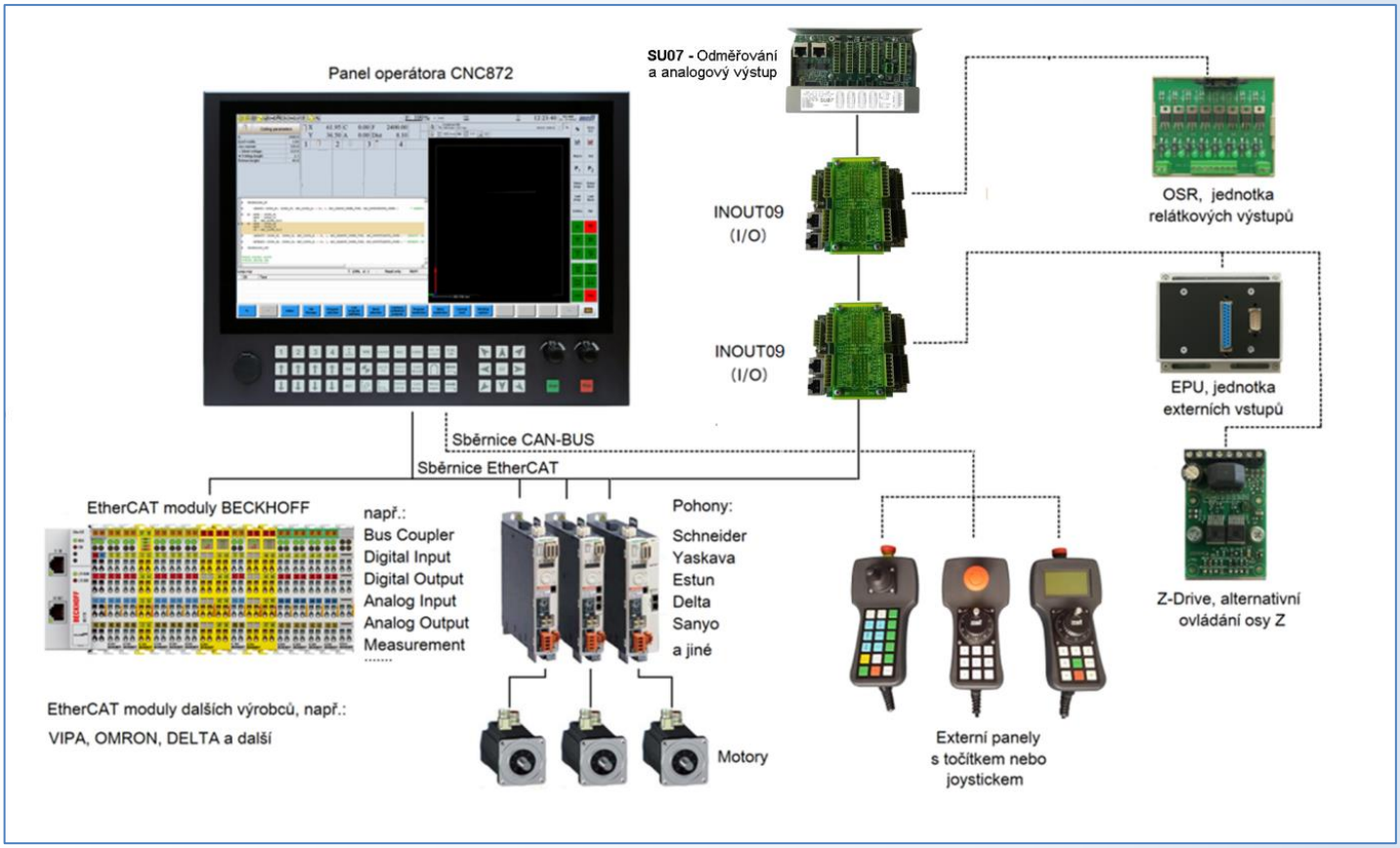

*Remote control with joystick –variant for water jet machines*

## Input and output modules and more

| | |
|---|---|
| Input and output module INOUT 09<br>• EtherCAT bus communication<br>• 32 digital inputs 24V or up to 32 analog inputs ±10 V<br>• 16 digital outputs 24 V, 0.5 A<br>• 4 digital outputs 24 V, 50 mA or up to 4 outputs with PWM signal generation<br>• 4 digital outputs 24 V, 6 mA or up to 4 analogue outputs 0 - 10 V |  |

| | |
|---|---|
| Input and output module INOUT 08<br>• Communication via CAN bus<br>• 32 digital inputs<br>• 24 digital outputs<br>• Optionally 4 differential analogue inputs (instead of 8 digital outputs).<br>• Optionally 4 digital outputs with PWM signal generation. |  |
| SU 07 (4 channel encoder interface board)<br>• EtherCAT communication<br>• 4 channels for connecting incremental encoders<br>• 4 analog outputs ±10 V |  |
| Z-DRIVE<br>• Module for DC motor control using PWM signal. Up to two modules can be connected to an INOUT 08 or INOUT 09 card. | |
| EPU<br>• "External Panel Unit" allows connection of buttons for remote control of the machine. |  |

## Application example



# Basic technical data

## Hardware

The exact specification varies according to the specific model of the control system, and also changes due to constant development. Here are the main common characteristics:

- An industrial computer equipped with a multi-core Intel processor and SSD drive.
- The control panel has a 15.6", 18.5" or 22" touchscreen display and buttons to control movement and the most frequently used functions.
- EtherCAT bus for connecting servo drives and other peripherals such as input and output modules, stepper motor control modules, etc.
- CAN bus for connecting older and less demanding peripherals.
- Remote control with joystick or knob can be connected.

## Software

A single software is currently used for all control system models, but it is scalable and adaptable to a wide variety of applications.

- 1 ms base period, fast PLC loop up to 250 µs.
- Minimum block duration for smooth speed transition is 4 ms.
- 20 interpolated axes.
- 20 servo loops. If a position control loop in the control system is use, it is possible to set 4 sets of position control parameters, use feed forward or use a digital filter (frequency band hold) to reduce resonances.
- Backlash compensation.
- Non-linear compensation - for each servo it is possible to activate position compensation depending on the position of up to 4 different axes and independently for both directions (compensation of linearity, tilt, sag, etc.).
- Thermal compensation.
- Spindle control with both speed and position feedback.
- Constant cutting speed.
- Ability to cut threads with lead-in and lead-out.
- Tool radius compensation – adjustment of the tool path to account for the radius of the tool being used.
- Tool length compensation – accounting for the length of the tool used.
- Five-axis machining – simultaneous interpolation of XYZ and the tool orientation vector. Depending on the machine geometry and tool length, the machine position in XYZ is compensated during tool tilting so that the position of the tool tip remains unchanged.
- Coordinate system transformation – two independent linear coordinate system transformations (for geometric axes, “program transformation” and “workpiece transformation”), two independent offsets (for all axes).
- Machine transformation – allows the control system to be adapted to a wide variety of machine geometries while maintaining NC programming capabilities in Cartesian XYZ space. Examples of use: pipe cutting with development programming, robots, machines with mechanically coupled axes.
- Independent path shifting via a rotary knob during operation.
- Optional manual control via potentiometers on all axes.
- Ramps with acceleration and jerk limitation - S-ramps.
- Dynamic speed control with look ahead analysis.
- Possibility to connect a measuring probe.
- Logging of events for later processing (diagnostics, machine usage monitoring, etc.).

- Graphical preview of the NC program (2D or 3D), tool position and machining visualization.
- Simulation of machine movement and machining using a 3D model of the machine, workpiece and tool.
- Remote connection using TeamViewer or AnyDesk software - remote management, diagnostics, software upgrades or technical assistance.
- Languages: Czech, English, German, Polish, Russian, And French, in addition partial (only the most used parts of the user interface are translated): Hungarian, Romanian, Bulgarian, Croatian, Dutch, Ukrainian and Lithuanian.