CNC System Design Requirements

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01 Overall demand
CNC host mainly contains three modules, display module, operation module and chassis module, of which the display and operation belong to the necessary components, chassis module according to the customer's requirements for the optional, in the design of the program, we can provide with chassis and without chassis two design options, and try to ensure that the reuse of the first two modules and the installation of the consistency of the first two modules, which facilitates the customer's selection.
The mounting mode of CNC host needs to meet three kinds: upper support, lower support and split type; in the design scheme, the structure of CNC needs to be compatible with three kinds of mounting modes at the same time, the upper support and lower support are applicable to the environment with chassis module, while the split type is applicable to the environment without chassis module.
Currently existing products display module LCD screen and touch screen with 19 inches, resolution 1280x1024, touch screen for the resistive screen, around a circle of black for the silk screen layer, the new design program LCD screen and touch screen is not limited to 19 inches, and horizontal or vertical screen can be, the touch screen can be resistive or capacitive.
Operation module needs to contain the basic safety buttons, switches, PC keyboards, function buttons, etc., the layout can be played according to the new design ideas, the following figure is the existing products for reference, the new design of the program should be in line with ergonomics, commonly used and infrequently used buttons for a reasonable layout, and at the same time to do a good job of reasonable operation of the anti-dumbness, to increase the convenience of use.
Chassis module in addition to consider the structure of the installation of convenient and dust and oil, the design program needs to meet the basic interface requirements, the current system contains the basic interface USB interface and internet ports, as well as power supply interface, the need to retain the above interfaces in a reasonable and convenient for users to access the location.

The chassis shell needs to be reserved for a USB port, and the USB port has a dustproof and waterproof features, the following reference picture. In the case of the CNC mainframe upper or lower support, the size of the space for 2 RJ45 pass-throughs and a set of power cord-to-plugs needs to be taken into account at the adapters.
The CNC mainframe equipment is a key functional component of the machine tool equipment and needs to be designed to meet easy maintenance and basic weight requirements:

- Compact structure, good closure, no shaking during use
- Modular design (display module, operation module and chassis module) modules are independent, can be loaded and unloaded individually
- Easy maintenance, the equipment can be disassembled directly on the bed when maintenance is required on the client side
- Easy installation and support for a single person to do all the work of maintenance
The protection level of the whole machine is IP65, the internal industrial motherboard power consumption (65 watts ~ 80 watts), the design scheme needs to include active heat dissipation and the whole machine shell of the overall heat dissipation, shell materials and structural features to meet the characteristics of the heat dissipation fast, the following reference picture of the shell of aluminum alloy and the appearance of the structure of the heat dissipation of the teeth characteristics of the mounting to increase the heat dissipation area, but also to meet the demand for the appearance.
The interface design mainly focuses on the characteristics of the touch screen, highlighting the consistency of the overall style, with a good operating layout and the concept of module division, at the same time to meet the operating habits of the mainstream system, the overall style of the industry to do further optimization, and better enhance the ease of use of the product.
09 Server - Overall Requirements

Product appearance, installation method and operating environment

Define product specification by rated output current, 09A~160A product appearance serialization;
Book-style exterior, back panel mounting hole fixing, suspension mounting;
Upper and lower spacing ≥100mm for ventilation and heat dissipation;
IP20, air-cooled;
This mainframe is one of the current product lineups with a large inventory on the market, has some customer acceptance, and incorporates some of the basic characteristics of the needs just described.

**Aluminum body**
Machined and molded, recyclable

**Suitable for all types of industrial environments**
Fanless, fully sealed design, waterproof and dustproof

**RFID swipe zone**
Cloud-based user rights management system with multiple login method implementations

**Application desktop**
Access to all available applications

**Rigorously tested keys**
Passed EMC test, up to 1 million times service life, 2~3N key force control

**Humanized design**
Friendlier, more intuitive, more concise
The product specification parameters can meet the application requirements of mainstream products and have a certain degree of brand recognition.

- 12-inch color touch screen
- 4Gb RAM/32Gb hard disk
- One-piece aluminum alloy body for better heat dissipation
- Sealed design, waterproof and dustproof
- More than 1,000,000 keystroke life
- Power failure data protection
- Suitable for all types of lathes and milling machines up to 5 axes
02 New Large Screen - product positioning

The product positioning of the new large screen is centered on application scenarios in key areas, solving performance bottlenecks and highlighting the demand characteristics of high-performance mainframes.

**Target market**
The first target market is to support high-grade CNC machine tools within the Group’s segment, and to adapt to vertical five-axis, horizontal five-axis, gantry five-axis, large-scale boring machine, gear machine, horizontal gantry milling machine, turning and milling machine tools with complex control requirements.

**Technical positioning**
- High algorithmic complexity, requiring high CPU performance
- Diversified usage scenarios requiring high customizability
- High level of data security in key areas requires secure and reliable hardware and software design
- Complex machining processes requiring visualization and simulation capabilities

**User’s group**
- Key areas of enterprise equipment commissioning personnel, senior process personnel, with a high degree of system commissioning and process optimization capabilities
EtherCAT & Profinet standard industrial fieldbus support, OPCUA & UMATI & MTConnect multiple industrial Internet support, to provide field control level, production level, company level data access needs, to promote synergies.

Split mainframe, modularized operation module, expandable external handheld and tool magazine ICM, perfectly adapted to different types of mainframe installation and operation needs.

Compared with the high-grade Siemens system, the coverage of Class A functions of the high-grade CNC system has increased from the original 81.9% to more than 86%, and supports parallel five-axis algorithms, setpoint switching, parking axes, gantry axes, etc.

Base through the plate typical gantry five-axis, vertical five-axis, horizontal five-axis, gear machine and other high-grade CNC machine tools factory acceptance, S pieces of processing efficiency increased by 5%, the processing effect in line with the requirements of the GB/T 39967-2021 standard, with the conditions of saleable

Modular, highly reliable, customizable, showing universal style, both functional and practical high-tech sense of appearance design
We do the overall solution improvement of the product around the three directions of safety and reliability, flexible customization, and high efficiency and practicality.

- **Safe and reliable**
  - Pass-through UPS power supply, maximum support 15s continuous power supply, to ensure data security
  - Large screen with fanless cooling design to enhance motherboard reliability

- **Efficient and practical**
  - High-definition large screen design, user information panoramic display, convenient interaction
  - Rich interface, support diversified device access, support different application ecology
  - Highly recognizable with a technological look and feel that reflects a universal style

- **Flexible customization**
  - Modular design, chassis optional, to meet the diverse use of the scene
  - Multiple mounting options to suit the design requirements of different hosts
  - Customized granule buttons for different industry applications
The new large screen host in the human-machine interface, mainly in the page navigation to make certain improvements, while combining some special features, do part of the layout optimization.

Two sets of dark and light configuration colors for users to choose different styles, windowed view, horizontal and vertical rows of buttons, more ergonomic interaction design, more efficient way of guidance.
Segmented design, user can customize the operation panel to enhance the user application scenarios.

Compatible with a variety of mounting chassis design, to solve the upper suspension, lower arm, left-handed, right-handed a variety of chassis design.

19-inch full lamination process design, clarity increased by 1.6 times, while equipped with a full keyboard input, more convenient operation.

Pass-through UPS power supply with key switch for more secure data protection mechanism.
Snap-on connection for quick connection and disconnection, durable and environmentally friendly.

Three-section rear panel design, easy to remove and install. Front panel replacement can be disassembled independently.

Fanless, integrated low power consumption, fast heat dissipation, maintenance-free pure metal structure model, rugged, anti-interference high.

Concealed connector design solves the problem of accidental touching during placement and installation.
Adoption of a common technology unified visual identity system color scheme, and design style with a certain degree of continuity.

Customizable buttons can be replaced, flexible to match different hosting customization needs, support for Chinese and English versions.

Keycaps are replaceable and support user-defined functions.

The operation area is divided into common function area, customized function area, manual control area, reasonable layout, more efficient operation.
The new control unit is designed and positioned to focus on market traffic models and improve product stability and ease of use.

**Target Market**
Focus on general-purpose machine tools with high stability requirements such as vertical machining centers, lathes, mill-turn machines, milling machines, engraving and milling machines, trusses, etc., mainly within the segment and gradually expanding to external markets.

**Technical Positioning**
Based on the original hardware and software architecture, adopting the split architecture, through the optimization of the software framework and circuit design scheme, compatible with the market mainstream command system, simplify the debugging tools, enhance the third-party power unit supporting capacity, to provide stable and easy-to-use CNC host computer.

**Users Group**
General industry CNC machine manufacturers, general operators and programmers need more convenient operation and easier system debugging tools.
The overall idea of the product is centered around the current scenario needs and is enhanced in three aspects: safety and reliability, affordability, and ease of use.

- **Safety**
  - Pass-through UPS power supply, maximum support 15s continuous power supply, to ensure data security
  - Fanless thermal design for increased motherboard reliability

- **Usability**
  - Supports both physical and touch screen operation modes, DIN&ISO dual command system, landscape design, close to the mainstream of the market.
  - Highly recognizable with a technological look and feel that reflects a universal style

- **Economy**
  - Split design, chassis optional, lower cost
  - Optimize production costs by reusing the dimensions of high-grade chassis modules
03 New Computer - Design Principles

The new standard host design principle is to have the flexibility to customize the ability, while user-friendly operation, with more complete security measures.

All-in-one low power consumption, fast heat dissipation, maintenance-free pure metal structure model, rugged, anti-interference high

Laser engraved silk-screened replaceable pellet button design, color, silk-screened function to flexibly match different host customization needs

The operation area is divided into common function area, customized function area, manual control area, reasonable layout, more efficient operation.

Concealed plug-in connector structure design, to solve the problem of mistouching in the process of placement and installation.

The 12-inch full lamination process is designed to improve clarity by 1.6 times, while equipped with a full keyboard input for more convenient operation;

Pass-through UPS power supply, more secure data protection mechanism

Compatible with a variety of mounting chassis design, to solve the upper suspension, lower arm, left-handed, right-handed a variety of chassis design
The interface of the new computer has been improved in three aspects: practicality, performance optimization and scalability:

- **Practicality**: the main interface placement function is the collection of functions with the highest frequency of use by users, highlighting key information through appropriate typography, colors and fonts, so that users can quickly access the key content.

- **Performance optimization**: economic interface design should try to avoid the use of excessive images and animation effects to reduce the interface loading time and occupy system resources, while optimizing the interface layout and control design to reduce unnecessary gaps and repetitive content.

- **Scalability**: the interface design takes into account the scalability of the system and adapts to the future expansion of functions and changes in user needs.

Fanuc home page

New system home page
04 Servo-interface description

Functional interface

Power supply interface: RST AC380V voltage/current input, UVW voltage/current output
Signal interface: data interaction with peripheral devices
Application scenario: multi-axis drive
03 Reference Competitor
CIMT2024 Reference Exhibit - The main unit
Brand: SIEMENS  
Product: S120

Brand: B&R  
Product: ACOPOSmulti

Brand: HEIDENHAIN  
Product: Gen3

Brand: KEBA  
Product: KeDrive D3
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