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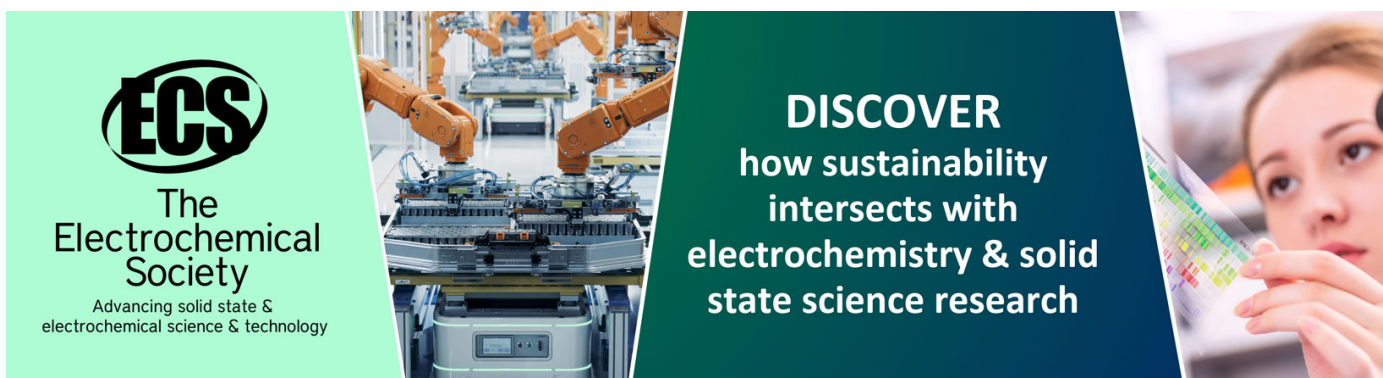
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To cite this article: Yi Yang and Yingfeng Fu 2021 *J. Phys.: Conf. Ser.* **1750** 012075

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Research on Communication Module of Communication or Automation Equipment

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Abstract: In order to give full play to the application functions of communication or automation equipment, we need to strengthen the research work of communication modules. Especially in some production places where the environment is more complex, we must ensure that the communication module has the data collection function, only in this way can we achieve automation and intelligent operation. In the process of researching the communication module, we need to realize wireless data transmission and control. At the same time, we also need to ensure the stability of data, and realize the wireless operation function, and use the application function of communication or automation equipment to ensure the stability of information and data transmission.

1. Communication or Automatic Equipment Communication Module System Overview

In the process of designing the communication module of communication and automation equipment, we need to design from the main components of the communication module. When designing the communication module, we must ensure that it has a housing. The main function of the housing is that the basic module of the communication or automation equipment can form a contact connection area, and a positioning pin is arranged in the connection area, and the positioning pin is inserted into the corresponding receiving part of the basic module. We not only need to use fixing bolts to pass through the housing between the positioning pins, but also need to screw the threaded part of the fixing bolt into the threaded hole of the basic module. At the same time, we have to set the extension part of the housing perpendicular to the connection area in the center position of the basic module. The main function of this part is to accommodate the fixing bolt passage. In addition, the collar and the fixing bolt should be connected to each other. The collar can form a section around the fixing bolt, and a groove of the collar is arranged inside the housing along the channel. Therefore, we must ensure that the collar can move axially in the groove. Only in this way can we give full play to the application functions of communication or automation equipment communication modules [1]. The specific design structure of the communication module is shown in Figure 1.



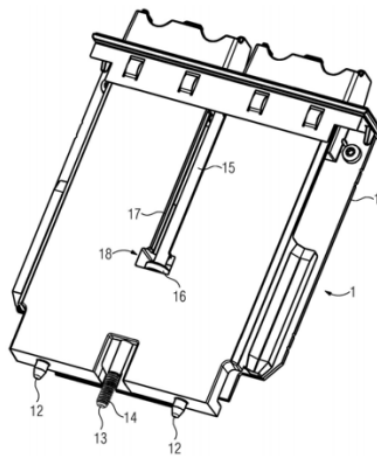


Figure 1 Design Structure of Communication Module

(In Figure 1: 1 indicates the communication module; 11 indicates the communication module housing; 12 indicates the positioning pin; 13 indicates the fixing bolt; 14 indicates the thread section of the fixing bolt; 15 indicates the screw of the fixing bolt; 16 indicates the collar; 17 indicates the passage of the fixing bolt; 18 indicates the groove of the collar)

The process of designing communication or mobile device communication modules needs to be based on the application requirements of the communication module. When designing multi-pole plug-in components in the connection area, it is also necessary to ensure that the plug-in components are connected with the corresponding plug-in components of the basic module. When designing the positioning pin, we must ensure that the positioning pin has a tapered head and a locking element. In this way, we can make the positioning pin more than the corresponding receiving part of the basic module. In the actual design process, we also prepare a knurled wheel that can rotate the fixing bolt at the collar. In addition, during the design of the collar, we must ensure that the collar and the fixing bolt screw are connected in a torsion-resistant manner. Moreover, in the communication module, the axial end of the groove needs to form a targeted stop along the channel. When designing the communication module housing, we must ensure that the housing contains at least one transmitting and receiving unit, so that the relevant data information can be transmitted and received in time. When designing the launching and receiving unit, we need to complete the design work according to the physical layer protocol or the data link layer protocol. In this way, it can be ensured that the transmitting and receiving unit in the housing can fully function.

2. Key Technology of Communication Module

In the process of continuous development of industrial automation systems, in order to ensure that the automation system can operate normally and stably, we must rely on multiple communications or automation equipment to complete automated production and control. In the application process of communication or automation equipment, we need to use industrial communication networks to communicate. In the meantime, we also need to apply the communication module in the scope of manufacturing and process automation control, so as to complete the control and adjustment of machinery and equipment. In the operation of communication or automation equipment, we use programmable logic controllers. Peripheral modules, contactors, communication modules, switches, routers, etc. with scattered characteristics are all important components of the logic controller. When designing automation engineering systems based on industrial automation equipment, we need to build a key framework system. Moreover, in the industrial communication network, we also need to use real-time communication protocols (Profinet, Profibus) or real-time Ethernet to realize the communication function between different automation equipment.

When designing communication or automation equipment communication modules, effective use of modular electronic equipment is of great significance. Electronic equipment is mainly composed of basic electronic equipment and electronic modules connected with the basic pen. Among them, the electronic module needs to be mechanically held in the basic device. In the design of electronic modules and basic equipment, we need to ensure that the installation position of the electronic module can be coupled to the basic equipment. At the same time, we need to pivot the electronic module to the middle position through a pivoting motion, and then push it to the connected position. At this time, we can electrically connect the basic equipment with the electronic module at the connection position and fix it on the basic equipment part [2]. When using a modular electronic unit to design a communication module, first of all, we need to couple the electronic module at the carrier stop and the corresponding housing stop and the edge of the housing. Secondly, we can use the pivoting motion to make the electronic module overcome the force generated by the clamping spring in the stopper, so that the electronic module can be moved into the connection position. Finally, we need to complete the locking design of the electronic module and the module carrier in the connection position.

In the process of designing the communication module in the modular switch network node of the industrial communication network, the basic unit of the switch network node and the port module must be included. The main function of the port module is to couple the connection interface on the communication network. Besides, the port module must be connected to at least one interface to forward the communication data that enters through the connection interface of the modular switch network node. Otherwise, in order to be able to achieve extended functions, we have to use port modules instead of functional modules to complete the design work [3].

When designing the communication module of the industrial automation system modular communication equipment, we must ensure that there are basic modules and expansion modules that can be connected to the basic modules. Corresponding multi-pole plug-in components are required between the basic module and the expansion module, and a positioning pin is also designed at the expansion module. The positioning pin can be introduced into the groove of the locking chute of the basic module and locked in this position. The positioning pin also needs to be connected with a groove surrounded by a tapered head. In the case of being locked, the locking element in the locking slide groove needs to be inserted into the groove. The locking chute should also be perpendicular to the positioning pin, and the positioning pin should be moved from the locked position to the unlocked position. In the unlocked position, the locking element of the locking slide can open the groove of the positioning pin.

3. Communication Module Design Content and Specific Implementation Process

3.1. Design Content

In the process of designing the communication module of communication or automation equipment, its main purpose is to simply connect with the basic module in the communication and automation equipment. So as to achieve the purpose of receiving and sending data information, and automatic control and adjustment of industrial equipment. In the design process, we not only need to complete the design work according to the requirements of the communication or automation equipment for the use of the communication module, but also effectively improve the design of the communication module. In the process of designing the communication module of communication or automation equipment, we mainly design from the shell part. We need to ensure that the housing can be in contact with the basic modules of communication or automation equipment to form a connection area. In addition, we should also set positioning pins in the connection area to ensure that the positioning pins can be inserted into the receiving part of the basic module. Multi-pole plug-in components can also be arranged in the connection area, and we must ensure that the plug-in components are connected with the corresponding plug-in components of the basic module. In the process of selecting the shell of the communication module, we have to design the sending and receiving unit, only in this way can we complete the data receiving and sending functions. When designing the transmitting and receiving unit

of the housing, we need to design according to the physical layer protocol or the data link layer protocol [3].

In the process of designing the communication module of the communication or automation equipment, when the communication module and the basic module are both tightened, the sleeve ring and the housing between the communication module can be connected to each other in cooperation. At this time, the plugging force required by the automation system can be transferred to the housing. In the process of disassembling the shell, we need to rotate the fixing bolt in the unscrewing direction. In this way, the communication module housing can be separated from the basic module by moving through the collar. This disassembly method can provide the required pulling force during the disassembly process, so that the communication module can be removed from the basic module in time. Furthermore, we can use positioning pins and fixing bolts to ensure the correct and reliable installation or removal of the communication module. Especially when the fixing bolts and collars are arranged and designed, this can achieve a compact configuration of the communication module with a small number of mechanical parts, so as to meet the communication requirements [4].

In order to ensure the design level of communication modules for communication or automation equipment, we need to carry out effective design improvements. In the process of improving the design of the communication module, we must make the positioning pin have a tapered head. In addition, the positioning pin needs to include a locking element, so that the positioning pin can be locked in the corresponding receiving part of the basic module. When the design of the collar is improved, a knurled wheel that can rotate the fixing bolt is prepared on the collar. This is also an effective communication module improvement program. The knurled wheel can not only install the communication module correctly and effectively without using tools, but also connect the collar and the screw of the fixing bolt in a torsion-resistant way. In the process of improving the design, the axial end of the groove may be formed along the channel as a stopper used on the collar. In the process of designing the end position, the stop part of the communication module needs to be limited within the stop part touching the basic module. Moreover, the shape of the positioning pin of the communication module needs to be inserted into the corresponding receiving part of the basic module. In this way, a reliable connection between the communication module and the basic module can be realized, and the stability of the mechanical connection can be ensured.

3.2. Implementation

In the specific implementation process of the communication module of communication or automation equipment, the communication module is mainly used to achieve the purpose of communication. The housing can form a contacting connection area with the basic module of the communication or automation equipment. In the connection area, a multi-pole plug-in element needs to be arranged, and at the same time, it is connected with the corresponding plug-in element in the basic module. At this time, communication or automation equipment needs to use the communication network switch in the industrial automation system. In the implementation process, the housing of the communication module has a PHY conversion circuit and a sending and receiving unit of the MAC conversion circuit. In the design process of the sending and receiving unit, it is mainly based on the physical layer protocol and the data link layer protocol. The switch contains multiple sending and receiving units, which can be connected by separate communication modules. Simultaneously, we can switch freely according to the coupling components. In the coupling process, we need to use the controller's backplane switch or high-speed bus [5].

Two positioning pins are also provided in the connection area of the communication module, and the positioning pins need to be inserted into the corresponding receiving parts of the basic module. The positioning pin has a tapered head, and it also contains a locking element. We can fasten it in the corresponding receiving part of the basic module by locking. In the positioning pin, we can use the fixing bolt to pass through the shell and screw it into the threaded hole of the shell of the basic module. At this time, we can use the screwdriver on the bolt head to tighten and loosen the positioning pin and the fixing bolt to complete the installation or removal process of the communication module.

A channel for accommodating the fixing bolt is arranged in the middle of the housing of the communication module, and the extension of the channel and the connection area are perpendicular to each other. While the fixing bolt and the collar are connected, the collar needs to be torsionally connected around the screw of the fixing bolt and the screw of the fixing bolt. In this way, we can install and remove the communication module without using tools. A groove using a collar is also provided along the channel in the communication module housing, and the collar can move axially in the groove. And its axial end can form a stop for the collar along the channel. When the basic module is installed in the communication module, the shape-fitting connection of the sleeve ring and the housing of the communication module is mainly completed by the plugging force transmitted from the sleeve ring to the housing. In the case of installation, the fixing bolt can be completely transferred to the housing of the basic module to complete the entire installation process. When the communication module is disassembled, the disassembly process is completed in the opposite way. We need to turn the fixing bolt in the direction of the overhang. In this way, after the housing of the communication module can be moved away from the basic module housing by the collar, we only need to remove the communication module from the basic module.

4. Conclusion

In summary, in the process of researching communication or automation equipment communication modules, we need to understand the role of communication modules in industrial automation system applications. Meanwhile, we must proceed from the design purpose of the communication module to ensure that the communication module is compatible with the operation requirements of communication or automation equipment. Only in this way can the design level of communication modules of communication or automation equipment be improved, and the level of industrial automation can be improved.

References:

- [1] Feng Shiwei, Liu Huiling, Zhu Yaojun. Design and Research of Communication Reinforcement Device for Automation Equipment[J]. China Science and Technology Investment, 2019, 000(035):211.
- [2] Zhang Lili. Research on Communication Fault Diagnosis and Disposal Methods of Substation Automation Equipment[J]. Electromechanical Information, 2017.
- [3] Zhao Weidong. Research and working mode analysis of communication automation equipment in power system[J]. Smart City, 2018, 004(004): P.62-62.
- [4] Li Shuai, Yang Zizhong, Zhang Jianbo, et al. Research and work mode analysis of communication automation equipment in power systems[J]. Commodity and Quality, 2019, 000(008):247.
- [5] Mao Guolong, Li Junwei. Research on distribution automation construction for power supply reliability[J]. Electric Power Big Data, 2018.